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NEW YORK has somewhat improved upon the example set by Boston in the formation of an organized body for constructing wholesome and decent habitations for the very poor. The Boston association proposes to build houses on the best possible plan, and rent them at reasonable rates, with the expectation of securing a good income on the investment, but of dividing only six per cent among the stockholders, and retaining the surplus, if there should be any, as a reserve fund for further charitable objects. This plan has much to recommend it, and as there are thousands of persons in all parts of the Union who would be glad to make sure of six per cent interest of money invested in such a safe sort of property as tenement-houses under good management, without pretending to any benevolent sentiments, there should not be much difficulty in propagating this form of charity very extensively. The New York Tenement-House Building Company, which has undertaken in that city to begin a similar work, proposes to limit the dividends paid to stockholders in the company to four per cent, reserving the surplus as a fund for the benefit of the tenants of the houses built by the company, who are to share in it in proportion to the amount of rent which they may have paid. This novel sort of participation in profits is probably intended to give the company a control over its tenants, by interesting them in retaining their rooms as long as possible, and avoiding such misconduct or delinquency as would lead to their expulsion, which, we suppose, will involve a forfeiture of their rights in the reserve fund; but it may easily afford a sort of life-insurance for the well-behaved tenants, which will save their families much hardship and distress. Advantage is also taken of the New York law which was made to facilitate the multiple ownership of real estate in the so-called "Home Club" apartment-houses, to promise to tenants of the new company the privilege of converting their interest in the reserve fund into stock of the company, a certain amount of which, as in the "Home Clubs," will entitle the possessor to the absolute ownership of a tenement corresponding in value with the amount of his stock. The Home Club method is for the owners of apartments to place their stock in the hands of trustees, who issue to them leases of their apartments, under such restrictions as the owners collectively see fit to impose upon themselves; and the same system, applied to tenement-houses of a lower grade, will secure the compliance, even of the stockholders, with the regulations of the house; while the tenement, or the stock representing it, forms just as good a piece of property as a house with four outside walls, and the owner, or his heirs, can live in it rent free, or may sell it, or let it to other persons and derive an income from it. The first operations of the company will be confined to the worst quarter of the city, in the neighborhood of the Tombs prison, where the poorest and filthiest people in New York congregate, in dens which have no parallel elsewhere in this country; and it is intended to provide for these people rooms in which they can live without danger from any filth which they do not themselves bring into them, and without paying more for rent than would be asked in the noisome hives which occupy the rest of the district. There is no question that such charity is more needed in this region than anywhere else in New York, but the company will find its task there a hard one, and if it can, even after years of effort, show half a dozen large tenement-houses filled with clean, orderly and prudent Polish Jews and Italian rag-pickers, it will certainly deserve and receive the congratulations of the charitable world.

A STRIKE is now in progress in the iron region of Ohio and Western Pennsylvania which, although it has thrown more than a hundred thousand men out of employment, seems to have had no very obvious pretext. In fact, so little understood is the movement that several theories have been put forward to account for it, the most interesting, though not perhaps the most probable, being that the strike is ordered for the purpose of forcing the manufacturers of steel nails in this country to abandon their business, on the ground that by the substitution of steel, rolled direct from the cast ingot, in place of the hand-worked wrought-iron nail-plates, a large number of puddlers and other workmen skilled in preparing wrought-iron will be thrown out of employment. A strike against the use of steel nails would now be about as likely to succeed as one against the rotation of the earth, and more reason is to be found in the complaint put forward by the officers of the Amalgamated Association of Iron and Steel Workers, that notice had been given of a reduction of twenty-five per cent in the wages of a certain class of workmen. Even if this reduction were more general than seems to be intended, the disposition, both of masters and men, in the iron trade seems of late years to incline toward the reasonable adjustment of wages according to the state of the market, of which both parties can judge; and as no attempt appears to have been made to settle the present difficulty by arbitration or conference, there is, perhaps, a little truth in the suggestion that the officers of the Amalgamated Association, finding their authority greatly diminished since the last great strike, have seized upon the first pretext for bringing on another general battle, knowing that, if victorious, they will regain a supremacy over their associates more complete than ever, and preferring, for the chance of this, to risk the complete disorganization of their association, which would probably follow a disastrous defeat. Small as the prospect of success in such an undertaking appears, the leaders probably count for help upon the effect which the enforced curtailment of production would have upon the iron market. A hundred thousand men can make a great deal of iron in a day, and considering that the consumption of iron, notwithstanding all the complaints of over-production, is reckoned by millions of tons, it is by no means unreasonable to suppose that a general cessation of production, even for a few weeks, might result in the prospect of a scarcity of iron, which would advance the price, and with higher prices for their product the manufacturers would be glad to restore wages to the point insisted upon by the officers of the Association, who would thus secure a victory, the effect of which would last long enough to serve their purposes, although, so far as the workmen are concerned, it is very doubtful whether wages could be maintained long enough to reimburse them for the millions of dollars of losses which they will incur by the strike.

A NEW element has also entered into the contest, which seems likely, unless the officers of the Amalgamated Association can devise means for lessening its effect, to interfere seriously with the success of any plans for controlling the iron market by strikes. A few of the larger mills in each district promptly acceded to the demands of the Association, and signed a scale of wages providing for about ten per cent reduction in place of twenty-five. These mills, together with such as employ men not belonging to the Association, are now in full operation, and it is said that an agreement has been entered into by the masters under which orders coming to the mills now closed are executed at those which have signed the scale, for the account of the firm which originally received the order. Orders for iron are not plenty at present, and the mill-owners can by this arrangement keep their customers, and continue to sell iron at a price which the lessening of the supply probably renders more remunerative than it would otherwise be, at the same time that they gain leisure to make

repairs and improvements, and escape the most serious burden of dull times, that of keeping from one motive or another workmen, who cannot be profitably employed. If this sort of coöperation among the manufacturers, which is, after all, perfectly legitimate, should have its natural effect, the striking iron-workers have very little to hope for, and, although we sincerely wish that they could all be sure of employment for the rest of their lives at higher wages than they have ever yet dreamed of, the only way, so far as we can see, in which they are likely to reach that condition of prosperity is, first of all, to repossess themselves of the independence and self-reliance which it is so pleasant for men who dislike the labor of thinking to delegate to ambitious demagogues; and secondly, to set themselves more earnestly than ever to do their work well, and to live the quiet, prudent, industrious life which seldom fails in this country to bring its reward sooner or later.

A VERY important law has just been passed by the Legislature of New York, and signed by the Governor, regulating the manner in which liens for work or materials shall be imposed and enforced in that State. The mechanics' lien laws in New York have been repeatedly changed within a few years, so that it has not always been easy for architects to follow them closely enough to protect their clients against their operation, and the new statute is so sweeping, and so well calculated to give trouble to owners of buildings, that it is particularly necessary for those who have to advise in regard to such matters to make themselves familiar with it. Unlike most lien laws, the New York statute gives those who furnish materials, as well as those who give only labor, "for buildings and other improvements" upon any estate, whether with or without the knowledge or consent of the owner, the right to advertise and sell the estate at auction, and pay themselves out of the proceeds for their goods, in case of failure of the person who actually bought them to meet his bills, classing them, for this purpose, with the poor mechanics whom the law allows, avowedly out of consideration for their necessities, and not for justice, to demand and receive from the owner of a building erected under contract the wages which the contractor may have failed to pay them out of the contract price which he has received. As enforced for the benefit of workmen, the operation of the law amounts simply to diverting by force the money of the presumably rich owner of the estate, to give it to the poor mechanics, with nothing but their daily wages to live on, who have been swindled out of them by a third person, whom the law confesses itself too feeble to catch; and it is rather creditable to human nature that such obviously unjust statutes should be submitted to, and even commended, by those who are most likely to be made the victims of them; but to extend to the dealers in materials, who are quite as likely to be able to bear the loss of their money as the average house-owner, and have all the opportunities for judging of the character and responsibility of the contractors who buy from them, and of recovering money due them, which other business men enjoy, that privilege of seizing the property of innocent third parties, and filling up vacancies in their own pockets with it, which has been given to mechanics in deference to their poverty, seems to us a perversion of the principle involved in such laws.

HOWEVER, the law-makers of New York having held a different view of the matter, their statute now provides that all persons, firms, associations or corporations who shall hereafter perform any labor or service, or furnish any materials which may have been used or are to be used in erecting, altering or repairing any house, bridge, wharf, building, pavement, fence, fountain, fruit or ornamental tree, shall be entitled at any time during the performance of the work or the furnishing of the materials, or within ninety days afterwards, to write in a book at the county clerk's office a notice that the estate is to be held liable for payment for the work or materials, whether these had been furnished by order or consent of the owner, or of any contractor or sub-contractor in an agreement to which the owner was a party; and at any time within a year after the filing of the notice the claimant may proceed to have the estate sold at auction by the sheriff for his benefit. So far, the law favors both workmen and "material men" much more strongly than most statutes of the kind, but as a compensation for this, it provides a rather novel, though only partial, protection for the owner, to the effect that if he shall refrain from overpaying a contractor, or mortgaging his estate, or otherwise endeavoring by collusion to favor the contractor, or escape his own duties, he shall not be liable to pay, on account of all the liens filed against his estate, a greater sum than the price stipulated in the contract, and remaining unpaid at the time the lien is filed; and all claimants under the law are obliged, within ten days after filing their liens, to post a notice of them in a conspicuous place on the estate, or deliver notice to the owner; and after such notice is given, the owner can make payments to the contractor only at his peril. Unfortunately, the statute does not also provide that the workmen and material men shall complete the building at the contract price, so that the owner is still liable to find himself left, after paying, perhaps, half the agreed sum to his contractor, and the other half on liens to the workmen and material men whom the contractor had failed to pay, with a partially completed building on his hands, which he must finish at his own expense in the best way he can. Of course, the only way to guard the owner against such mishaps is to insist upon making contracts by which a very large reserve is kept back out of the earlier payments to the contractor, the percentage of reserve gradually diminishing as the building approaches completion, and the amount which the owner would probably have to pay to get his house done after satisfying the liens on it grows less. We shall give the text of the statute in full later, and advise architects practising in New York State to make themselves familiar with it. For others this brief summary will perhaps be sufficient.

THE Trustees of Columbia College in New York have at last established the course of instruction in Sanitary Engineering, in connection with the School of Mines, which has been so long discussed. The time which has passed since the course was first proposed has been well employed, however, and arrangements seem to have been made for giving the best and most thorough instruction in the subject that the country can afford. The management of the course will be placed in the hands of Dr. John S. Billings, and we need hardly say that a better choice could not have been made. Dr. Billings will deliver lectures on hygiene, and instruction in the use of the microscope will be given by an assistant. The course will occupy four years, and graduates in it will receive the degree of Sanitary Engineer. If we are not mistaken, a gift or promise was made to the college some years ago of funds to establish systematic instruction in Sanitary Engineering, and it is gratifying to find that the Trustees have taken measures to make the course as thorough as the others in their renowned School of Mines.

LE GENIE CIVIL quotes from *La Nature* a description of an easy, and apparently effectual process for coating articles of iron with a shining black varnish, more adhesive and durable than any of the ordinary varnishes or japans now in use. No apparatus is needed for the process, which, by the way, is the invention of M. Puscher of Nuremberg, beyond an iron box in which is fitted a grating and a tight cover. The first thing to be done is to sprinkle the bottom of the box with powdered soft coal to a depth of about three-quarters of an inch; the objects to be coated are then placed on the grating, and the box is then covered and hermetically sealed, and placed over a fire. After the expulsion of whatever moisture there may be in the dust, the coal itself begins to decompose, and thick, tarry vapors are given off. The bottom of the box is kept at a dull red heat for about half an hour, after which the whole is removed from the fire and allowed to cool. On removing the cover the tar is found to have condensed on the surface of the iron objects in the box, forming a glossy coating, so flexible and adhesive that thin articles may be bent double without cracking it. Except for the danger of bursting the box, which might be considerable if the coal-dust were damp, or if air were allowed to mix with the gas in the box while it remained on the fire, there seems to be no difficulty about the process, and as coal-tar is known to penetrate to a certain extent into the pores of cast-iron even when applied in a liquid state, it is not impossible that when brought into contact with it in a condition of vapor it may attach itself to the metal even more thoroughly and permanently.

SOME CELEBRATED TIMBER ROOFS.[1]—II.

Eltham Palace Hall.

FRENCH architects and engineers in the sixteenth, seventeenth and eighteenth centuries occupied themselves a good deal with roofs with curved ribs, and two systems of constructing the rib were worked out. In the most modern of them, that invented by Colonel Emy, the ribs were constructed of a series of thicknesses of bent timber, one on the back of another, and held together by bolts. In the older system, that of Philibert Delorme, the ribs were also built up, but the pieces composing them are placed side by side, and either form a polygon approaching a semicircle, or are cut to bring them to a curve. In fact, the ribs are very much such as have been already described as used for the great dome of the French Corn Market.

There is, however, a great difference between a dome — the strongest of all forms and one permitting the introduction of as many rings of ties as may be desired — and a roof over an ordinary oblong space, where no such binding together is admissible, and where straight rafters may have to be used, which loads the rib at certain points only. In the latter case, a good many precautions have, generally speaking, to be taken to prevent the rib from being unequally loaded, and so either spreading or losing its shape in some other way. The rib made of unbent timbers side by side, on Delorme's plan, is admitted to be stronger than the one made of bent timbers laid one on the back of the other; but both have been largely used, and good examples of both may be met with, even if we confine ourselves to English ones alone, and leave the French ones unnoticed.

A very fine roof with ribs, one on which the load (though light) is borne without a rafter, solely by the rib, covers the great conservatory built by the Duke of Devonshire at Chatsworth. This building was rather notorious at the time of its erection, but has probably now passed out of the recollection of most people not familiar with Derbyshire. It consists of a wide and lofty central portion, with a kind of broad aisle at the sides, roofed at a lower level. The central roof here is of the section of a pointed arch and hipped at both ends, and is entirely covered with glass. It is carried by timber ribs, and the glazing is on the ridge-and-furrow principle. The low aisle referred to forms to some extent an abutment for the ribs, and the ridge-and-furrow glazing helps no doubt to fortify them, but still the greater part of the strength is derived from the ribs themselves. I had recently an opportunity of examining this building carefully, and though it does not appear to have been as well taken care of as one could wish, still the roof remains sound and the ribs appear true to their curve and in line with one another.

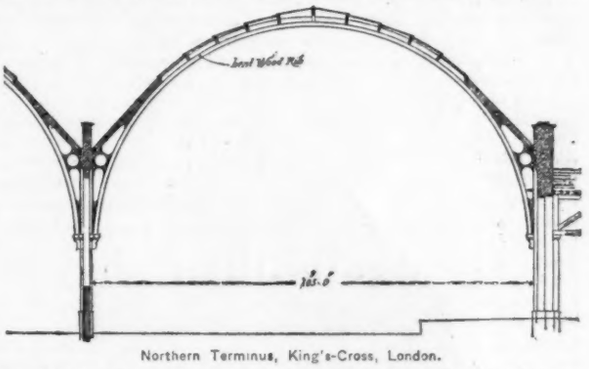
Another rib roof, and one which obtained a world-wide celebrity, was the roof over the nave of the Great Exhibition of 1851, reproduced in its main features in that of the nave and transepts of the Crystal Palace at Sydenham. Here, again, the load is a continuous one, the roof-covering being the same shape as the rib.

It was intended that the '51 Exhibition should have a flat roof over the nave, carried by long lattice girders, and it is understood that the merit of suggesting a semicircular roof instead belongs to Sir Charles Barry. The construction was no doubt designed by Sir Charles Fox, who made the working-drawings of the entire building with his own hands. The span of this roof was seventy-two feet; the principals were twenty-four feet apart from centre to centre; they consisted of timber ribs measuring seventeen and one-half inches deep and eleven inches wide at the back, and eight inches in width in the main part of the rib, and formed of no fewer than eleven pieces of timber bolted together. This construction combined the two systems of rib-building described. These ribs appear to have stood well, as have the ribs of the Crystal Palace roof.

For the Exhibition of 1862, at South Kensington, a somewhat more solid building was designed by Captain Fowke. It had a nave with a semicircular rib, but had also a rafter, so that the covering did not follow the outline of the rib. The span was greater than at the Crystal Palace, being eighty-five feet against seventy-two feet; the depth of the rib was one-half inch more, being increased to eighteen inches, and the width of it was ten inches. It was made of six pieces only, and was entirely on the older or Delorme's construction. The distance apart was increased to twenty-five feet. This roof was, I believe, re-erected at the Alexandria Palace, and was destroyed in the great fire at that building. In the '62 Exhibition many annexes were built, with ribs having a span of fifty feet, and a distance apart of fifteen feet. The ribs were three inches by nine inches, and these roofs failed seriously by spreading.

In the great buildings occupying the same site, and covering many acres of ground, which were erected for the Fisheries Exhibition and added to for the Health Exhibition, many acres of roofing were put up by the late General Scott, of which the wider spans recalled to some extent the annexes already alluded to. These are, however, a little stronger in various respects, and they appear to have answered the expectations of those who designed them. The span of these roofs is a little less, and the principals are considerably nearer together, than in the roofs which failed in 1862. The span is forty-eight feet. The polygonal rib (which is virtually semicircular) springs ten feet from the floor. The sides of the building continue to a height of twenty-seven feet six inches from the floor, or twenty-eight feet from the ground, and the ridge is forty feet from the ground. This rib is two and three-fourths inches thick by about ten inches average depth, and is in three thicknesses, made up of deals: a middle one and one-fourth inches thick by nine inches, and two three-fourths inches by nine inches at the sides. The pieces of which the rib is composed are six feet long. At every six feet there occurs a radiating brace, nine inches by one and three-eighths inches, pointing to the centre of the arch. Each brace is worked into the substance of the rib, and seems to connect it to the uprights of the side framing or the rafters, as the case may be. The ribs are ten feet apart, and the boarding is carried by small rafters, six inches by two inches, laid purlinwise on the back of the principal rafter belonging to the truss. This is probably as slight a construction as has ever been successfully employed.

This series of roofs may be closed by a reference to a roof with timber ribs on Colonel Emy's plan that has failed. I refer to the roof put up at the terminus of the Great Northern Railway, King's-Cross, in 1852. This was a roof where a semicircular rib was combined with rafters, and the covering did not follow the outline of the



Northern Terminus, King's-Cross, London.

rib. The spans were each one hundred and five feet, the ribs were twenty feet apart, and each rib is stated to have consisted partly of eight and partly of sixteen one-and-one-half-inch bent boards, screwed and bolted together. The trusses soon after being fixed showed signs of spreading, and were buttressed at the feet. The ribs became distorted in shape, being perceptibly flattened at the top, and after remaining in that condition for a good while (probably about twenty years), the ribs of one of the two spans have been replaced by trusses with a wrought-iron semicircular rib. This experience seems to tell decisively against the use of ribs made on Colonel Emy's plan of bent timber, for they were employed here under conditions on the whole very favorable.

The roofs with oblique ties, like Westminster Abbey or the Rouen Hall, and those with curved ribs, like the Crystal Palace or the Health Exhibition, by no means exhaust the list of roofs without tie-beams. Another method of dealing with the same problem was worked out towards the close of the period which we call the Middle Ages, and, as it resulted in the most splendid and most thoroughly architectural roofs that we have to consider, I have left it to the last.

The earlier stages of the growth I am about to describe may be illustrated from church roofs; the concluding and most complete was employed chiefly for the roofs of halls much wider than the nave of an ordinary church, and it is from such halls that we shall get our best examples. Let us go back to church roofs, as they were executed at the middle of the fourteenth century.

The walls in common use were very thick, and as the gutter was usually an eaves gutter, it became customary to carry the rafters to the exterior, and to frame them into a short horizontal timber, which

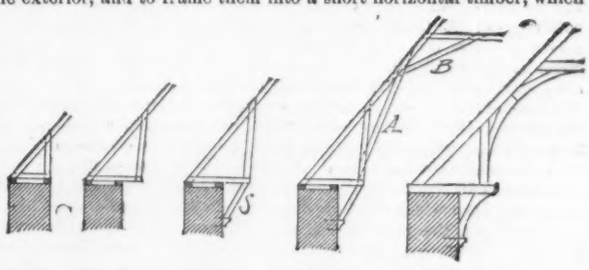


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

lay across the wall, and from that timber to carry up a little post or prop flush with the inner face of the wall, to support the rafter near its foot (see Fig. 1). The idea suggests itself that by prolonging this short horizontal timber, usually called the wall-piece, the prop assisting the principal rafter might reach it more nearly at the point where

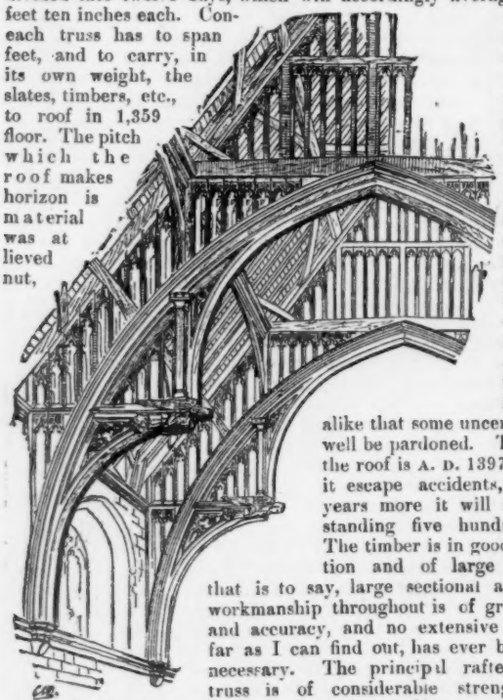
[1] A lecture by Professor T. Roger Smith, delivered at Carpenter's Hall on Wednesday evening, April 1st, being the last of the present series of "Free Lectures to Artisans on Matters connected with Building," given under the auspices of the Carpenter's Company, and published in the *Builder*, the illustrations being added by the *American Architect*. Continued from page 261, No. 492.

its aid was needed (see Fig. 2) It will be seen at a glance that the wall-piece here acts as a lever, of which the inner edge of the wall is the fulcrum. The weight of the rafter presses on the long arm, and the short one is accordingly extremely strong, and affords nearly as good a support for the upright post as though it rested on the wall itself. By degrees this wall-piece was pushed out more boldly, and it soon was felt that a strut, S, from the wall below (see Fig. 3) would give some additional strength, and would also satisfy the eye by preventing the rather unsightly overhanging horizontal piece from appearing to have nothing to carry it. So the strut was introduced, and in church roofs it became usual to curve or mould it, so as to make it a better architectural feature. The next step was to carry up from this same point a second strut, A (see Fig. 4), to a point farther up the rafter, and afterwards a tie was sometimes added at B, to give a hold on the collar-beam or tie-beam, whichever we call it, above. In roofs having any pretension to artistic treatment, the inner faces of these struts and ties were cut to curves. (See Fig. 5.)

This combination of struts, horizontal piece and posts is to be met with in many great roofs which were successfully framed in England, and a system somewhat similar, though not identical, was pursued in France. In the English examples the elongated wall-piece is called a hammer-beam. The horizontal tie or collar beam is generally about half-way up the rafter, and the lower half of the rafter is fortified by support derived from the hammer-beam, through the post and strut rising from it; the hammer-beam itself being in turn supported by a strut from a corbel built into the wall.

The finest and almost the earliest example of a hammer-beam roof, and no doubt the finest timber roof in the world, is the roof over Westminster Hall, which I will now proceed to describe.

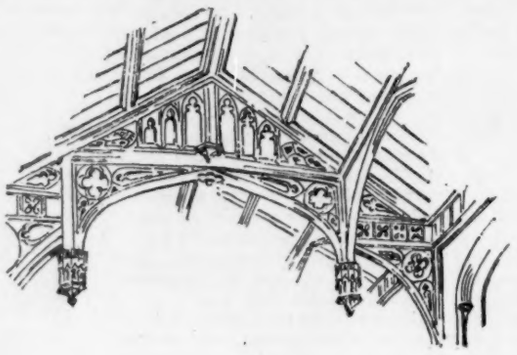
Westminster Hall is sixty-eight feet wide between the walls, and two hundred and thirty-eight feet long. It is forty-two feet high to the top of the walls, and ninety feet to the ridge of the roof. It is divided into twelve bays, which will accordingly average nineteen feet ten inches each. Consequently each truss has to span sixty-eight feet, and to carry, in addition to its own weight, the weight of slates, timbers, etc., necessary to roof in 1,359 feet of floor. The pitch or angle which the roof makes with the horizon is 52°. The material employed was at one time believed to be chestnut, but is really English oak. The appearance of the two woods is so much alike that some uncertainty may well be pardoned. The date of the roof is A. D. 1397, so that, if it escape accidents, in twelve years more it will have been standing five hundred years. The timber is in good preservation and of large scantling; that is to say, large sectional area. The workmanship throughout is of great beauty and accuracy, and no extensive repair, so far as I can find out, has ever been found necessary. The principal rafter of each truss is of considerable strength. The collar is placed just half-way up the rafter. The hammer-beams receive the foot of the rafters at their extremity, and each projects rather more than a quarter of the span from the wall, and has its end beautifully carved with the figure of an angel carrying a crown. A strong post is carried up from the end of the hammer-beam to the point where the collar and the principal rafters join. A timber, which may be called a wall-post, rises from a corbel far down the wall, and supports the under side of the hammer-beam at the point where it leaves the wall, and a second post vertically above this supports the principal rafter. There is a strong and richly-moulded rib which acts as a bracket or strut, springing from the corbel just referred to, and framed into the hammer-beam near its free end. A second similar rib, rising from the hammer-beam, supports the middle of the collar. All these pieces, except the principal rafter, are knit together by a magnificent arched rib springing from the corbel from which the lowest carved rib starts, and framed to the hammer-beam, the post on the back of that beam, the collar, and both the curved ribs. Above the collar a second collar is introduced, and a post connecting the two is added, while at the middle of the truss a central post, something like a short king-post occurs. Between all these timbers there is a kind of filling-in of mullions or small posts, the spaces between having ornaments at the heads. These, no doubt, perform quite as much the important structural duty of connecting every member of this great framework together, as they do the artistic duty of filling up the great outline with subordinate features which give scale to it, enable its vastness to be appreciated, and bring out the variety of its lines by their contrast with the uniformity of the filling-in.



Westminster Hall.

The usual longitudinal timbers, called purlins, running from truss to truss, are employed here, and furnish support to the roof rafters. The purlins are themselves supported lengthways from the great trusses by braces. The middle purlin is supported by a beautiful arched rib springing from the post on the hammer-beam. The upper purlin has a curved brace springing from the principal rafter. The lower purlin has a curved brace springing from the back of the great curved rib. Below this purlin occur the openings in the roof covering, which correspond with the great dormer windows, from which the hall receives a considerable portion of its light, but which are said not to have been part of the original design.

I have already mentioned the fineness of the workmanship; I need only add that every ornamental part is equally well wrought, and is designed with the greatest skill, so that whether we scrutinize a small

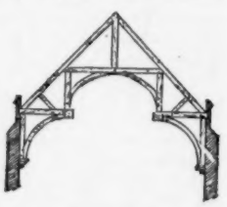


Christ Church, Oxford.

portion or endeavor to take in the impression to be produced by the whole, we are equally convinced that this is a masterpiece of architectural art as well as of the carpenter's skill.

For about 200 years, — that is to say, during the fifteenth and sixteenth centuries, — hammer-beam roofs were in use, and as many

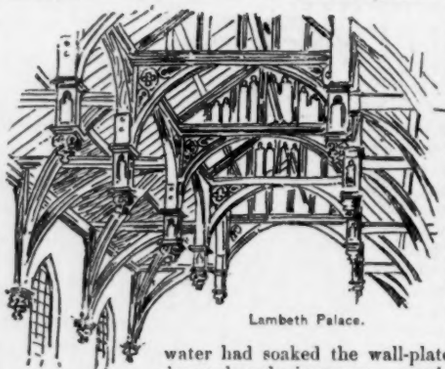
Gray's Inn Hall.



Westminster School.

considerable halls were built during those two centuries, numerous examples remain, none of them equalling Westminster Hall, though many of them approaching it in beauty, if not in extent. A few of these I will name to you.

The roof of the hall of Eltham Palace [See initial cut], dating, I believe, early in the fifteenth century, was a fine one. The hall was 101 feet long by 36 feet 3 inches wide, and 54 feet high, and had a hammer-beam roof very much like that at Westminster in design, but without the great rib, and rather less steep. This roof was of oak, and remarkable for the beauty of the workmanship and goodness of the material. This building has been allowed to fall into decay. Fifty-nine years ago Mr. Dunnage found that water had soaked the wall-plates, and they had decayed, and given way, occasioning the failure of the roof. Part of it is, however, still standing, but soon the whole will have disappeared.



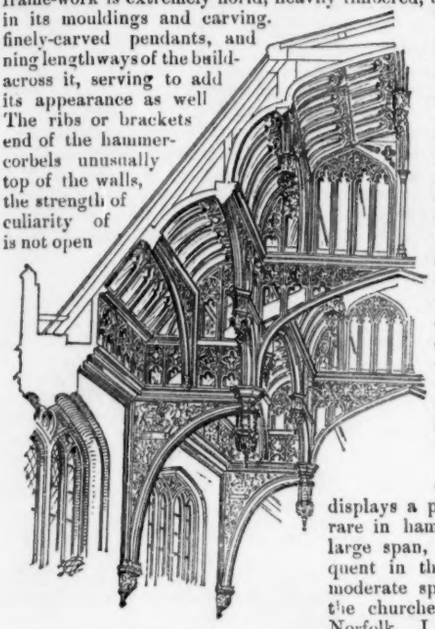
Lambeth Palace.

At Oxford, timber roofs of various degrees of beauty, but all belonging to this class of construction, occur in the halls of at least half a dozen colleges, namely, Corpus, University, Wadham, Jesus, Oriel, and Christ's Colleges; and in Cambridge in two or three such halls, as St. John's and Jesus Colleges. There is a plain roof of

this sort at Westminster School, one more ornamented at Gray's Inn Hall, and another at the Library at Lambeth Palace, an apartment of much dignity and beauty, 93 feet long, 38 feet wide, and 50 feet high.

Perhaps, however, the finest specimens after Westminster, certainly among the most ornate, are two that date from the sixteenth century, — the roof of Wolsey's Hall at Hampton Court Palace, completed about the year 1526, and that of the Middle Temple Hall, London, erected in 1572.

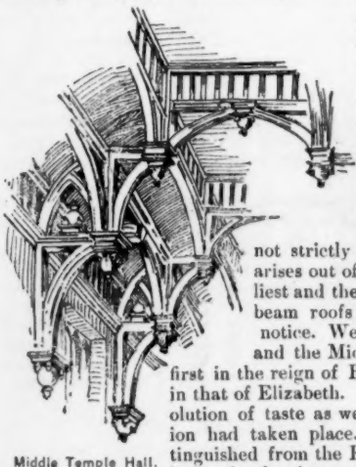
The hall at Hampton Court is 106 feet long by 40 feet wide, and 45 feet high to the top of the walls, and 60 feet high to the ridge. The frame-work is extremely florid, heavily timbered, and extremely rich in its mouldings and carving. There are some finely-carved pendants, and arched corbels running lengthways of the building as well as to the richness of across it, serving to add as to its strength. its appearance as well which support the The ribs or brackets beam spring from end of the hammer- far down below the corbels unusually so as to increase top of the walls, the truss. A pethe strength of culiarity of this roof is that it is not open right up to the rafters through its entire height, but a wooden ceiling of curved-outline is carried so as to cut off portions of the upper part. The outline of this roof is also peculiar externally.



Hampton Court Palace.

The roof of Middle Temple Hall displays a peculiarity which is rare in hammer-beam roofs of large span, though not infrequent in the timber roofs of moderate span to be found in the churches of Suffolk and Norfolk. I allude to a double hammer-beam. Suppose the collar-beam of one of these roofs to be cut, the middle of it to be taken away, and each of its ends to be treated just like a hammer-beam, that is to say, supported by a curved rib and made to carry a second post, which is carried up to meet the principal rafter high up, and above which there may, perhaps, occur a short collar-beam, we now arrive at a piece of framing to be found frequently in the churches in such towns as Ipswich. This outline forms the basis of the fine roof of the Middle Temple Hall. In addition to its double hammer-beams this roof has a series of very conspicuous curved ribs, placed lengthways of the Hall, carrying the purlins and springing from the posts of the truss near the point whence the curved ribs of the truss itself rise. The foot of the posts is formed with rich bosses, from which the ribs spring, and the whole produces a singularly rich and well-combined effect, which harmonizes well with the panelled woodwork that lines the walls, and with a rich screen at the lower end of the Hall.

There is an interesting record in connection with this Hall, — Shakespeare's play "Twelfth Night" was performed here in the year 1601; that is to say, during his lifetime, and during the time that his theatre, the Globe Theatre at Bankside, was standing and in use. In all probability, therefore, the play was represented by his company, under his direction, and it is even possible that he may have taken part in it.



Middle Temple Hall.

One other observation not strictly belonging to carpentry arises out of the comparison of the earliest and the latest of the great hammer-beam roofs that have come under our notice. Westminster, dating from 1397 and the Middle Temple from 1572, the first in the reign of Richard II, and the second in that of Elizabeth. In the interval a great revolution of taste as well as in literature and religion had taken place. Modern Europe, as distinguished from the Europe of the Middle Ages, began in the sixteenth century, and the reformation of religion, the revival of Greek and Roman learning, the birth of the modern literature and fine art, and the return to Classical architecture, are all parts of the great change which took place at this time. The reign of Elizabeth is marked by an architecture of change. You all must have heard something about Elizabethan buildings. Their great interest lies in the fact that in them we can see the old Gothic architecture disappearing and the revived Classic advancing. The two are, indeed, blended in a manner which is at times most picturesque. The Middle Temple Hall is an example, and a very good one, of this style. The roof is still in its main lines allied to the Gothic roofs which went before it, but its ornaments and its mouldings are both of them different, and follow Italian models. Just the same thing may be traced in the roof of Lambeth Palace Library, and it is worth notice, — if for nothing else, — as an example of how the architecture of old buildings properly understood preserves to us visible and tangible records of the political and social history of our country. Such buildings continue to illustrate the past for centuries after the men who erected them, with their manners and customs, have passed away from the face of the earth.

I propose, in conclusion, to mention a few important modern English roofs belonging to recent buildings of Gothic design. I shall first refer to a tie-beam roof of fir, but one in which the general principles adhered to by the carpenters of the Middle Ages are followed, — I mean the roof on the great hall of the Law Courts. This roof is not what is commonly called an open roof, — that is to say, not a visible roof like that of Westminster Hall, as it covers a vault of masonry which forms the ceiling to the hall.

The span of this roof is considerable. The pitch, as will be apparent to any one who notices the gable of the Hall in passing up the Strand, is comparatively steep, and would have permitted the use of tiles. The truss is a king-post truss, but the principal rafters are each of them double, that is to say, the two usual principal rafters are framed, in the usual manner, into the beam and king-post, but, in addition, immediately within them, a kind of inner and additional principal rafter is employed. This method adds a good deal to the strength of the roof, and was not unfrequently resorted to by Mediæval carpenters.

Another peculiarity, which was my chief inducement to include the roof over the Law Courts, is the employment of a *flèche* or timber spire to ornament the building. This spire is carried on the ridge of the main roof. These timber spires are among the most difficult and intricate pieces of carpentry known, and, owing to the great height at which they commonly start, few persons recognize their great size and consequent weight. Nor is the weight of a roof spire the only, or even the most serious, strain that has to be provided for. Such a feature rises in the unsheltered region where the full force of every hurricane that blows is felt, with nothing to break the shock; and although such a spire is usually circular or octagonal, so that the wind has less purchase against it than if it were square, we must not forget that it is very tall, so that such pressure as is sustained is intensified at the foot of the structure where the roof has to support it. And this weight and wind-pressure has to be supported, not on any solid basis like the masonry of a church tower, but on the framework of a roof spanning a vacant space. A famous example of such a structure is the *flèche* at Amiens Cathedral, which was measured and drawn by the late William Burges, and was shown, by the courtesy of the Architectural Museum, in our recent Exhibition. Another well-known example is the timber spire in the Cathedral of Notre Dame, in Paris, reconstructed by M. Viollet-le-Duc, and fully described and illustrated in his "*Dictionary of Architecture.*" Another, but smaller, example surmounts the roof of the Guildhall.

The details of the construction are hardly fit for a lecture like this, and can be best unravelled by a patient study on the spot; but the general principles involved may be said to be, first, the distribution of the weight over as wide a space as possible. This is effected by carrying part of the load on to trusses right and left of the one immediately under the spire itself, by the help of sundry oblique bearers, as strongly framed as possible; and, secondly, the *stiffness* of the actual spire. This is sought to be obtained by a central post running from base to top, a large number of sloping rafters, with many diagonal braces, introduced in every possible way, and a large series of horizontal ties or purlins at various heights; thirdly, by as strong a connection as possible between the spire and the base established on the trusses of the roof. A great many timbers are employed, put in various positions, so as to stay every point as much as possible, and the result seems to be that this lofty structure is perfectly secure.

The roof of Lincoln's Inn Hall, part of the new buildings erected by Mr. Hardwick in 1845, is a fine hammer-beam open roof. The hall is 120 feet long by 45 feet wide, and 64 feet high. The roof is framed of oak. Unfortunately I am not able to produce an illustration of it.

The great hall of the Manchester Assize Courts, a building erected from the designs of Mr. Waterhouse, has a fine open roof, of a construction which presents a somewhat unusual combination. The hall is 100 feet long, 48 feet 6 inches wide, and 75 feet high; it has seven timber hammer-beam trusses dividing the length into eight bays of the somewhat unusual extent of 25 feet each. The hammer-beam trusses do not, however, carry the whole weight of the superstructure, as is the case with every other roof with which we have dealt; two trussed purlins, or, more properly, latticed timber trusses, 16 feet 6 inches deep, run, in lieu of two of the purlins, from end to end of the hall and bear on the gable walls. These are, of course, framed to each hammer-beam truss, but, being of themselves of considerable strength, they do a large part of the work; and, indeed, I gather from the architect's own published account of this roof that, in his opinion, the chief duty is thrown upon them. They, he says, support the upper part of the roof, while the wall-brackets, which form the lower part of each hammer-beam truss, are needed chiefly to

steady them. The architectural effect of this roof is excellent, and I dare say some of those present have seen it.

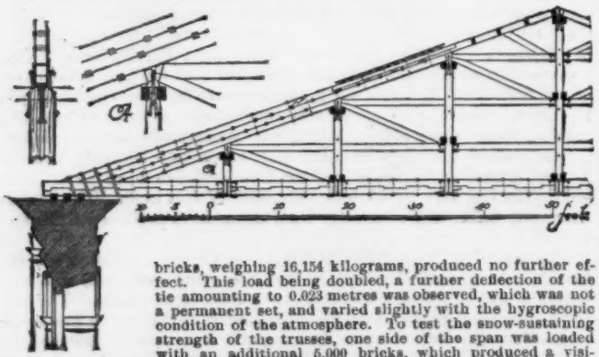
The last modern timber roof which I shall refer to is the roof over the Guildhall, London, erected a few years ago from the designs of the City Architect, Mr. Horace Jones, whose fine roof over the new Council Chamber, in which, however, the main framework is iron carrying a timber ceiling, is also illustrated by some of the drawings on the walls. Guildhall is 159 feet long. Its width is not perfectly uniform, but the average is 49 feet 6 inches; it is 80 feet high. The roof is constructed, as every roof which is to form part of a public building of the first importance should be, of oak. Practical carpenters will be the first to appreciate the increased strength and solidity and the greater tenacity of the joints, and the freedom from the risk of their crushing in, which the use of oak secures, as compared with deal, or even pitch pine.

In the Guildhall roof there are seven principals, and therefore eight bays of about 19 feet each. The collar of this roof is 29 feet long, and it was cut out of timber about 2 feet 8 inches square. In this roof each principal springs from a cluster of strong shafts carried up within the walls for the purpose of receiving it. Both structurally and as a means of procuring architectural effect this is very advantageous. There might have been some risk in putting the heavy weight of this roof on parts of the very ancient walls of this venerable hall which had not been so weighted before, and these lines of support divide up the length of the hall, and so make its extent perceptible. They also carry up the apparent (and, in fact, the real) support of each principal from the solid floor, and so aid the architectural treatment in more ways than one. The curved ribs are made very prominent in this truss, and the hammer-beam is kept rather modest than otherwise; it is neither carved at the end, nor marked out by a pendant, so that the line which catches the eye is that of the cusped arch of the moulded rib. This is an original treatment, but the success of the roof fully justifies the architect in the course which he adopted.

With these modern examples we leave our subject. I trust that the accounts of great roofs which I have been able to give you, and the illustrations which, in addition to diagrams made specially for to-night, I have been enabled to show you, by the courtesy of the City Architect, Mr. Waterhouse, Mr. St. Aubyn, and others, have been sufficient to prove that a great timber roof requires no small amount of skill to be brought to bear upon its design. I hope that we have also seen that it, above most things, calls for very careful selection of good material, and, perhaps, most of all for honest, painstaking care in the workmanship of every part. No single joint should be defective, and every part should bear truly on those into which it is framed. I think, also, we have seen abundant cause for ranking timber roofs as among the important architectural features of a large class of ancient buildings, and especially let me add, of ancient English buildings; but I cannot, lastly, help adding that I think we have seen reason also to be proud of our modern works in this line, as well as of the ancient ones. Neither in the architectural design of these structures, nor in the mechanical skill with which they are framed, need the architects or the carpenters of the nineteenth century fear a comparison with their forefathers of the fifteenth and sixteenth.

THE ROOF OF THE MOSCOW RIDING-SCHOOL.

The accompanying cut shows the truss actually used in roofing the famous Moscow Riding-School, built in 1818. The designing of this truss was placed, after several unsuccessful designs had been presented, in the hands of General De Betancourt, Director-General of Highways. After his design was approved, two experimental trusses were erected and severely tested before it was thought safe to begin work on the building. On removing the scaffolding used in erection, one of these trusses settled 0.08 metres, and the other 0.095 metres, but not enough to efface the camber which had been given to the tie. A load of 5,000



bricks, weighing 16,154 kilograms, produced no further effect. This load being doubled, a further deflection of the tie amounting to 0.023 metres was observed, which was not a permanent set, and varied slightly with the hygroscopic condition of the atmosphere. To test the snow-sustaining strength of the trusses, one side of the span was loaded with an additional 5,000 bricks, which produced a visible deflection. Finally a further distributed load of 10,000 bricks was added, which brought the entire load on the two trusses to 80,768 kilograms, or 79½ long tons, exclusive of their own weight. This strain only lowered the tie-rod by 4½ lines, and left it still 0.01 metres above the horizontal. It was observed, however, that the wooden keys inserted in the joints of the tie-beam — which was at first framed as are the principals shown in the cut — had crushed, and this led M. De Betancourt to change the mode of framing the tie-beam to that here shown.—Eds. American Architect.

The Pantheon Secularized. — The *Official Journal* publishes a decree restoring the Pantheon to its original use — a receptacle for the remains of great men — and ordering that the body of Victor Hugo be buried there. The funeral took place June 1.

THE BEST TEN BUILDINGS IN THE UNITED STATES.

HS anything like an authoritative expression of opinion the votes cast for the "best ten buildings" in the United States cannot be held to have as much weight as we would like, and so far as this goes we are disappointed with the result; but as we have been furnished with the names of 175 buildings which at least one architect thinks deserving of such rank, the purpose we had in view has been admirably subserved, as we have already stated.

The results of the ballot are as follows: —

Total number of voters, 75.
" " " buildings mentioned, 175.
" " " " receiving more than one vote, 56.

The great proportion of "scattering" votes shows that an adequate judgment could be deduced only from a very much larger number of votes than were cast, but when it is remembered that only 56 buildings received more than one vote each the balance is somewhat restored, and the final selection of the best ten from these 56 buildings may mean a good deal after all — especially in the cases of those which head the list.

The order in which they stand is: —

I. Trinity Church, Boston. Messrs. Gambrel & Richardson, Architects. 63 votes, or 84 per cent of the votes cast.
II. United States Capitol, Washington, D. C. Messrs. Hallet, Hadfield, Hoban, Latrobe, Bulfinch, Walter and Clark, Architects. 41 votes, or 55 per cent of the votes cast.
III. House of W. K. Vanderbilt, New York. Mr. R. M. Hunt, Architect. 37 votes, or 49 per cent of the votes cast.
IV. Trinity Church, New York. Mr. Richard Upjohn, Architect. 34 votes, or 45 per cent of the votes cast.
V. Jefferson Market Court-House, New York. Mr. F. C. Withers, Architect. 23 votes, or 30 per cent of the votes cast.
VI. State Capitol, Hartford, Conn. Mr. R. M. Upjohn, Architect. 23 votes, or 30 per cent of the votes cast.
VII. City-Hall, Albany, N. Y. Mr. H. H. Richardson, Architect. 19 votes, or 25 per cent of the votes cast.
VIII. Sever Hall, Cambridge, Mass. Mr. H. H. Richardson, Architect. 17 votes, or 22 per cent of the votes cast.
IX. State Capitol, Albany, N. Y. Messrs. [Fuller,] Eidlitz and Richardson, Architects. 16 votes, or 21 per cent of the votes cast.
X. Town-Hall, North Easton, Mass. Mr. H. H. Richardson, Architect. 15 votes, or 20 per cent of the votes cast.

Our readers can apply their own reasoning to this result and draw their own conclusions in confirmation of or dissent from this classification without help from us. But as it would take so few votes to exclude from the list about half of those included in it, it seems only fair to give the names of those ten buildings which received the next greatest number of votes, and they are. —

XI. New City-Hall, Philadelphia, Pa. Mr. J. McArthur, Jr., Architect. 14.
XII. Casino Theatre, New York. Messrs. Kimball & Wisedell, Architects. 14.
XIII. Lenox Library, New York. Mr. R. M. Hunt, Architect. 13.
XIV. Produce Exchange, New York. Mr. G. B. Post, Architect. 12.
XV. Columbia College, New York. Mr. C. C. Haight, Architect. 12.
XVI. Broad-Street R. R. Station, Philadelphia, Pa. Messrs. Wilson Bros. & Co., Architects. 11.
XVII. Crane Memorial Library, Quincy, Mass. Mr. H. H. Richardson, Architect. 11.
XVIII. Court-House, Providence, R. I. Messrs. Stone & Carpenter, Architects. 10.
XIX. Central R. R. Station, Providence, R. I. Mr. T. A. Tefft, Architect. 10.
XX. Harvard Memorial Hall, Cambridge, Mass. Messrs. Ware & Van Brunt, Architects. 8.

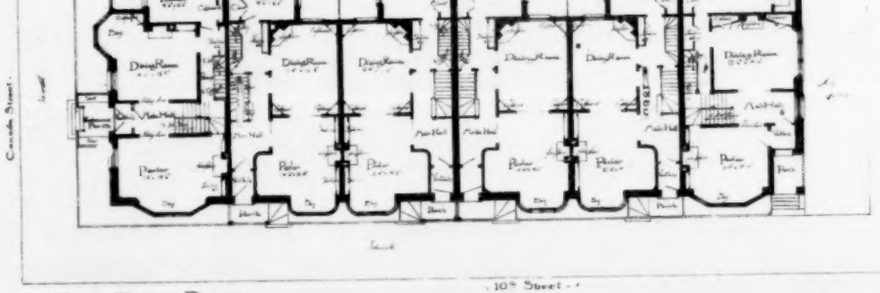
The manner in which local pride or prejudice did or did not aid in bringing about the above result can be perceived by analyzing the votes cast by architects practising in Boston, Chicago, New York and Philadelphia.

Boston voters, 9 in number, cast 22 votes out of a possible 90 in favor of Boston buildings, as follows: —

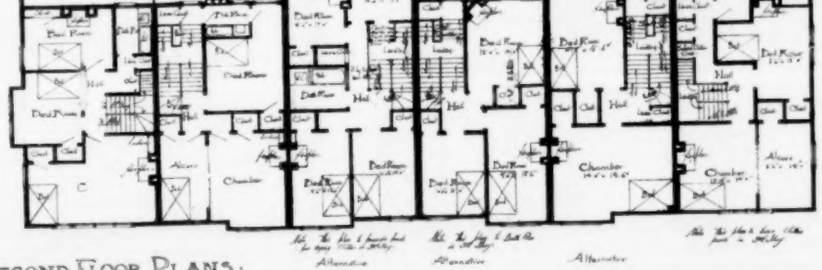
For: Trinity Church. Gambrel & Richardson, Architects. 8.
Ames Building, Bedford St. H. H. Richardson, Architect. 3.
Art Club Building. W. R. Emerson, Architect. 2.
New Store for R. H. White & Co. Peabody & Stearns, Architects. 1.
Spiritual Temple. Hartwell & Richardson, Architects. 1.
First Presbyterian Church. R. M. Upjohn, Architect. 1.
State-House. Charles Bulfinch, Architect. 1.
Boston & Providence R. R. Station. Peabody & Stearns, Architects. 1.
Tower of Brattle-Street Church. Gambrel & Richardson, Architects. 1.
Mutual Life Insurance Co. of New York's Building. Peabody & Stearns, Architects. 1.
Hotel Boylston. Cummings & Sears, Architects. 1.
House for J. C. Phillips. Peabody & Stearns, Architects. 1.

Chicago voters, 4 in number, cast 8 votes out of a possible 40 in favor of Chicago buildings, as follows: —

For: the Pullman Building. S. S. Beman, Architect. 2.



First Floor Plans.
of "Row" for Mr T. L. Schurmeier:
Cor. 10th and Canada Sts: St Paul: Minn.



Second Floor Plans.
of "Row" for Mr T. L. Schurmeier:
Cor 10th and Canada Sts. St Paul. Minn.

Carl Gilbert. Architect.
49 Gilfillan Block. St Paul Minn.

Alternative Study for
'Row' for Mr. T. L. Schurmeier:
St Paul: Minnesota:

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Study for a Row of Houses for Mr. T. L. Schurmeier.
St Paul Minnesota.
Cass Gilbert. Architect. 49 Gilfillan Block. St. Paul.
June 1885

Notes. 1st Story to be of Common Brick trimmed with Pressed Brick. 2nd Story of Akron Red Terra-cotta Tile. Gables rough cast plaster. Roof Black slate.

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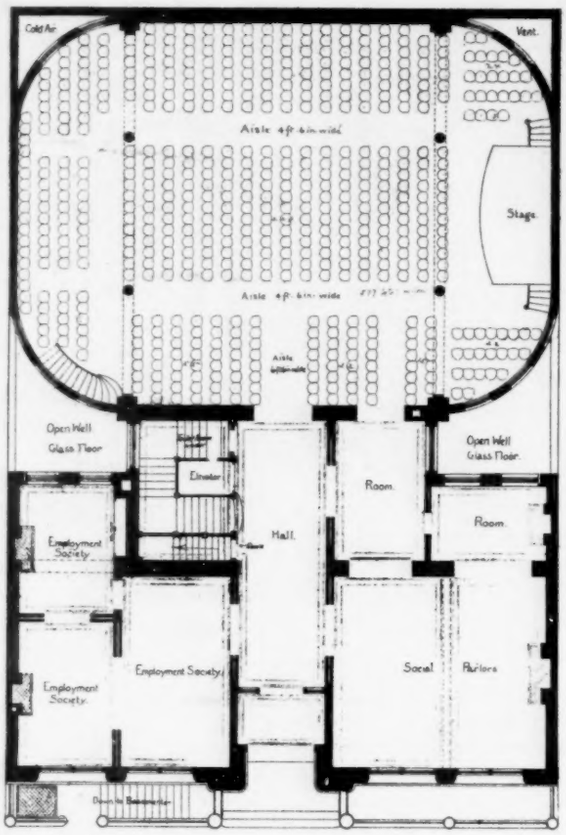
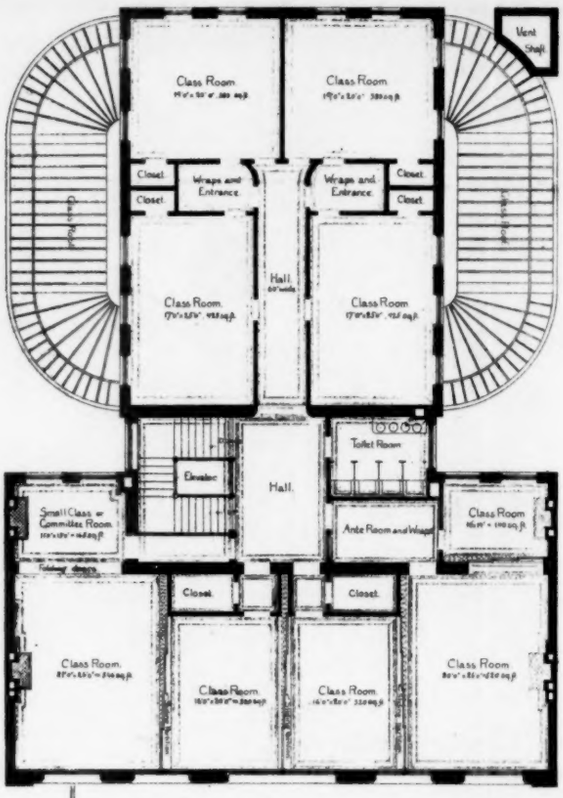
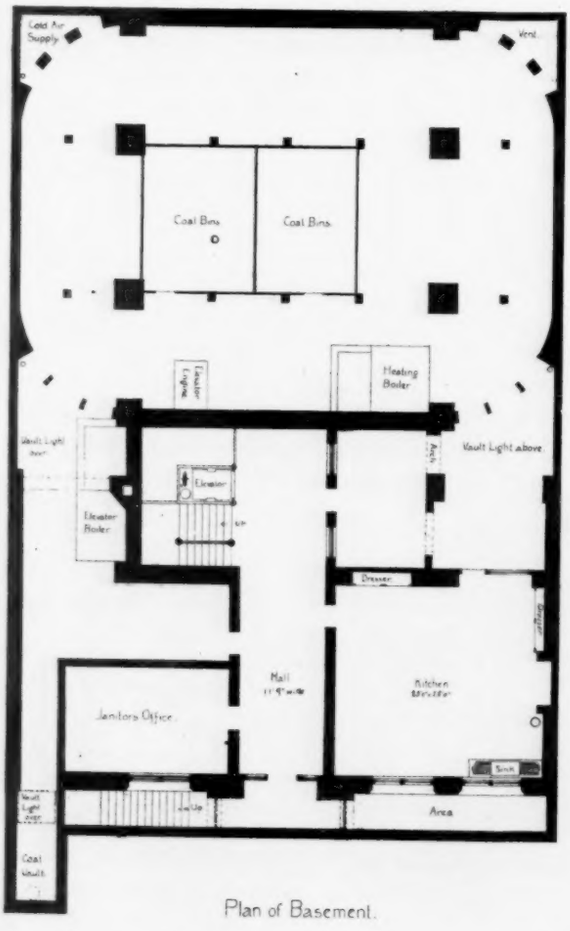


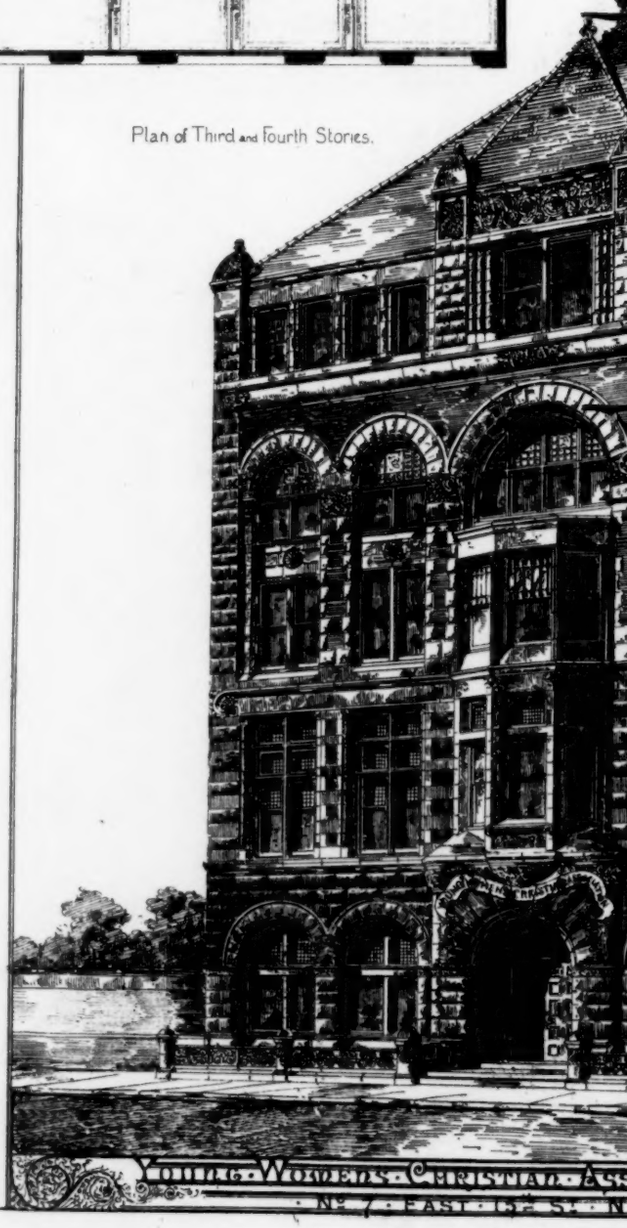
Plan of First Story.



Plan of Third and Fourth Stories.



Plan of Basement.



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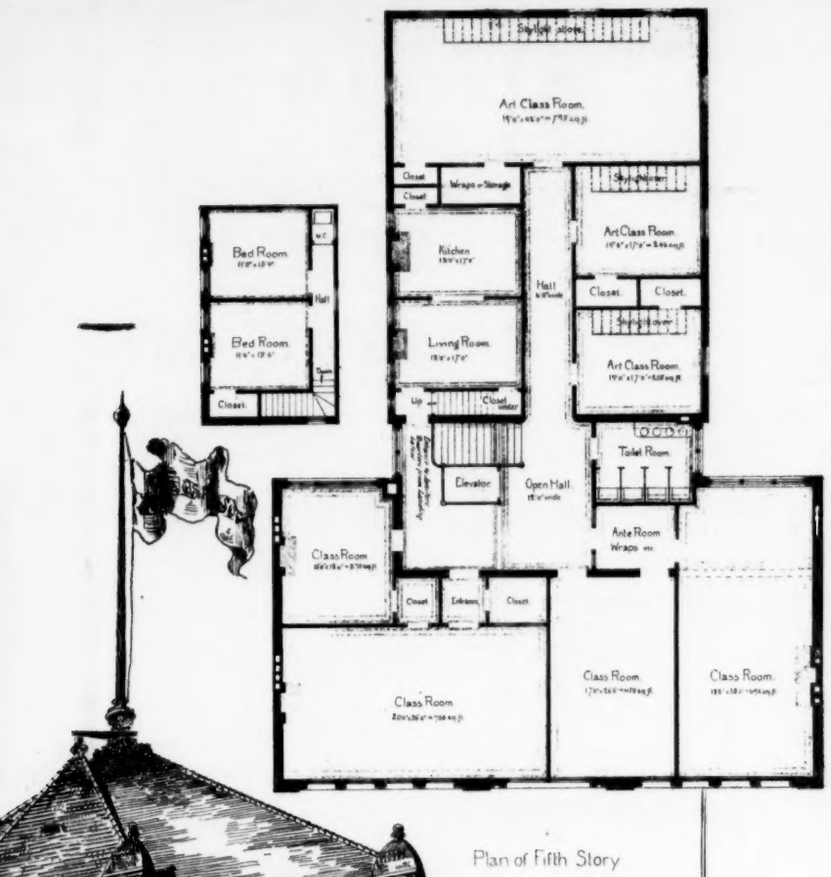
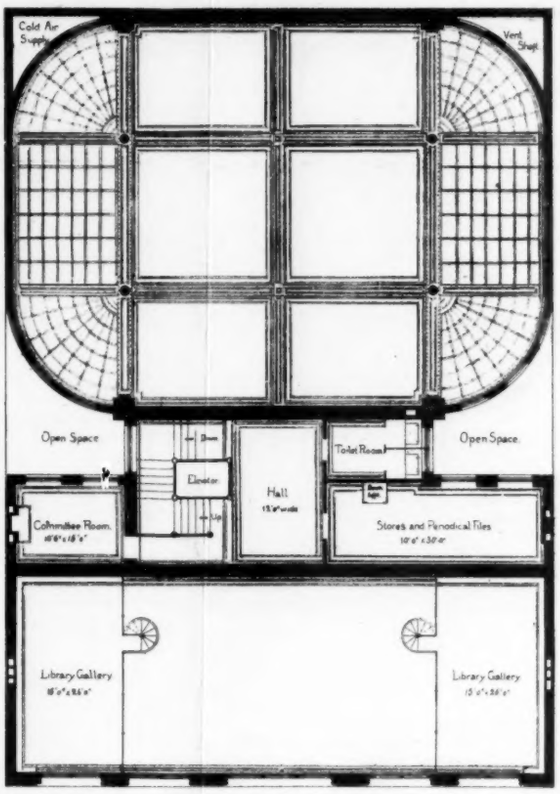
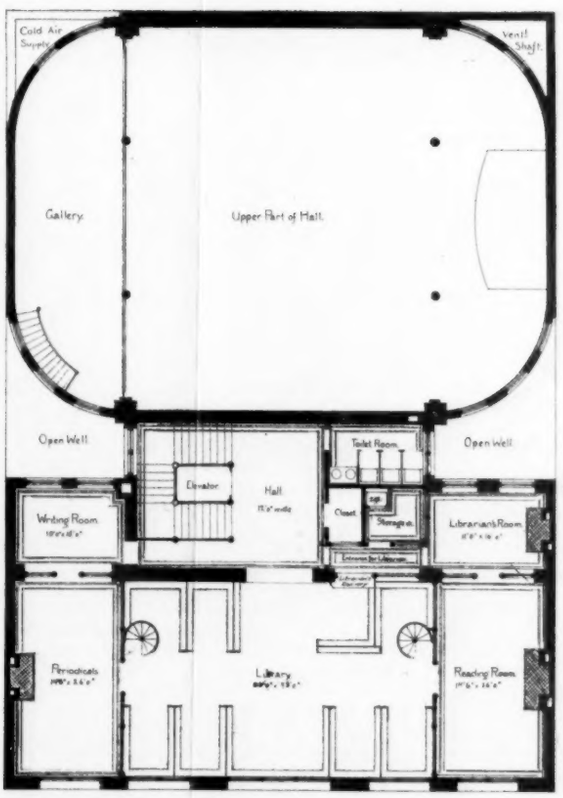


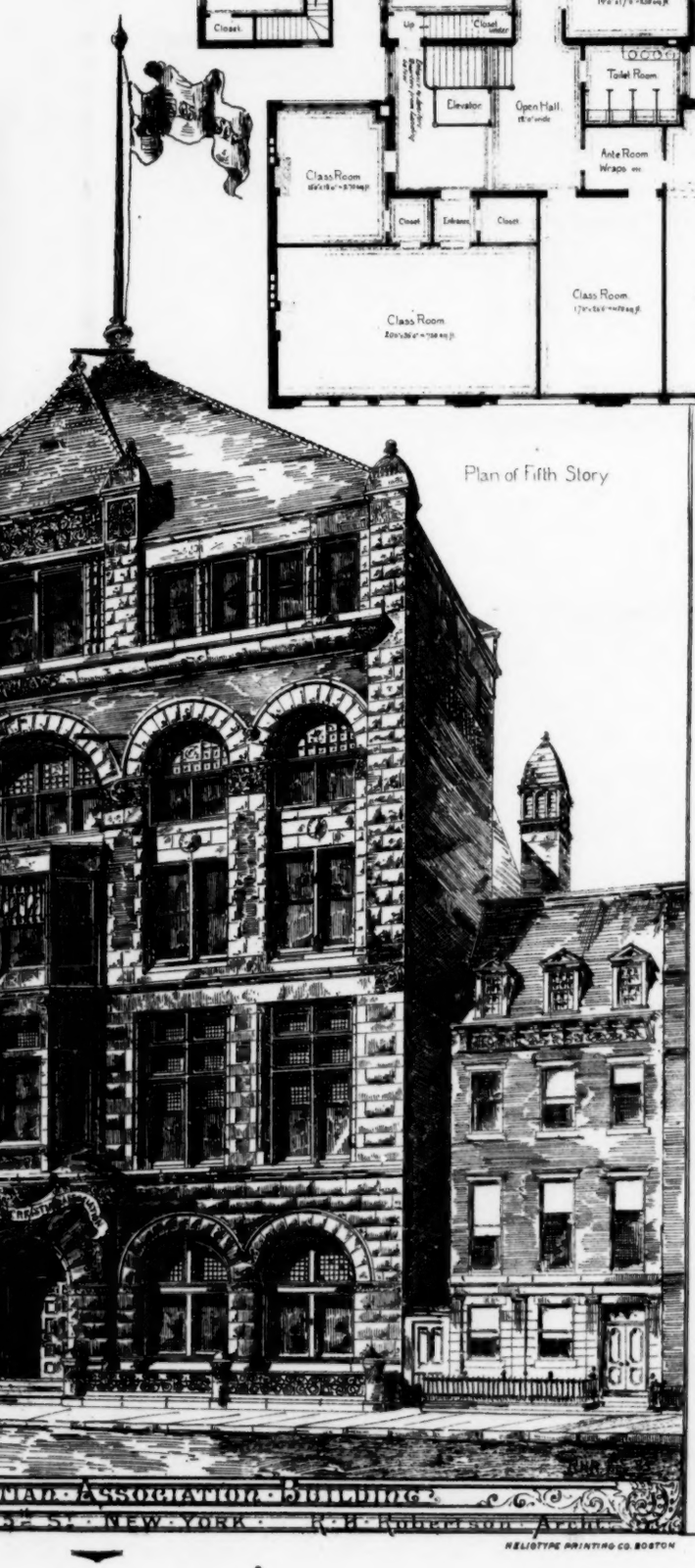
Plan of Fifth Story



Plan of Intermediate Story.



Plan of Second Story.



HELIOTYPE PRINTING CO. BOSTON

Philadelphia R. R. Station.	L. Eidlitz, Architect.	2.
C. B. & Q. R. R. Offices.	S. S. Beman, Architect.	1.
Cook County Court-House.	J. J. Egan, Architect.	1.
Board of Trade Building.	W. W. Boyington, Architect.	1.
Mr. S. Kent's House.	Burnham & Root, Architects.	1.

New York voters, 12 in number, cast 70 votes out of a possible 120 in favor of New York buildings, as follows: —

For: House of W. K. Vanderbilt.	R. M. Hunt, Architect.	9.
Columbia College.	C. C. Haight, Architect.	8.
Jefferson Market Court-House.	F. C. Withers, Architect.	7.
Trinity Church.	Richard Upjohn, Architect.	6.
Casino Theatre.	Kimball & Wisedell, Architects.	5.
House of Louis C. Tiffany.	McKim, Mead & White, Architects.	4.
House of Henry Villard.	McKim, Mead & White, Architects.	3.
Lenox Library.	R. M. Hunt, Architect.	2.
N. Y. Mutual Life Ins. Co.'s Building.	C. W. Clinton, Architect.	2.
Produce Exchange.	G. B. Post, Architect.	2.
House of Cornelius Vanderbilt.	G. B. Post, Architect.	2.
Union Theological Seminary.	Potter & Lord, Architects.	2.
St. Patrick's (R. C.) Cathedral.	Renwick & Sands, Architects.	2.
Madison Avenue M. E. Church.	R. H Robertson, Architect.	2.
Dakota Flats.	H. J. Hardenbergh, Architect.	2.
Metropolitan Opera-House.	J. C. Cady & Co., Architects.	2.
House of W. H. Vanderbilt.	Atwood and Snook [Herter Brothers], Architects.	1.
Jewish Synagogue.	L. Eidlitz, Architect.	1.
St. Paul's.		1.
Dutch Reformed Church.	Wheeler Smith, Architect.	1.
Manhattan & Merchants' Bank.	Wheeler Smith, Architect.	1.
Presbyterian Hospital.	R. M. Hunt, Architect.	1.
City-Hall.		1.
Union League Club-House.	Peabody & Stearns, Architects.	1.

Philadelphia voters, 6 in number, cast 21 votes out of a possible 60 in favor of Philadelphia buildings, as follows: —

For: Masonic Temple.	J. H. Windrim, Architect.	4.
Penn. R. R. Broad-Street Station.	Wilson Bros. & Co., Architects.	4.
New City-Hall.	J. McArthur, Jr., Architect.	3.
Girard College.	T. U. Walter, Architect.	3.
Insurance Co. of North America's Building.	Cabot & Chandler, Architects.	2.
Merchants' Exchange.	—— Strickland, Architect.	1.
St. Mark's Church.	John Notman, Architect.	1.
Philadelphia Trust Co.'s Building.	J. H. Windrim, Architect.	1.
Academy of Music.	G. Runge, Architect.	1.
Post-Office.	U. S. Supervising Architect's Office.	1.
New Jerusalem Church.	T. P. Chandler, Jr., Architect.	1.

The votes for the two Providence, R. I., buildings were cast entirely by local architects.

In conclusion we can only say that architects of all varieties of predilections and attainments, practising in every part of the country, have contributed to this result, and that we find considerable internal evidence that their opinions were expressed with care and deliberation.

THE ILLUSTRATIONS.

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

SKETCHES FOR A ROW OF HOUSES FOR MR. T. L. SCHURMEIER, ST. PAUL, MINN. MR. CASS GILBERT, ARCHITECT, ST. PAUL, MINN.

THE alternative design was adopted, although the entire scheme was abandoned, owing to failure to obtain sufficient alley room in the rear. The alternative design was to have been built of brick, faced with Philadelphia pressed-brick and Bayfield brownstone, a sandstone not dissimilar in color to the Longmeadow freestone. The estimated cost of this building was $38,000 complete.

YOUNG WOMEN'S CHRISTIAN ASSOCIATION BUILDING, NEW YORK, N. Y. MR. R. H. ROBERTSON, ARCHITECT, NEW YORK, N. Y.

RENDERING WOOD FOR BUILDING PURPOSES NON-INFLAMMABLE.[1] — II.

IN THE TOWER, LONDON, ENG.

ALL timber, when treated by any of the preservative processes in general use, becomes short; that is, it breaks in two crosswise easily, and when the whole wood is impregnated its tensile strength becomes impaired. It no longer when dry retains the same amount of elasticity it possessed when in its natural state; when in a moist state it recovers a great deal of this. The shortness is easily tested by taking a piece of dry preserved timber, and, trying to split it with an axe, it will be found that the axe will not follow the course of the grain of the wood. This, then, seems a reason in favor of impregnating the wood, and especially the smaller pieces, after they have been cut to fit into their several places. Again Sabine says: "It is necessary that no ungalvanized iron should come in contact with wood impregnated with sulphate of copper (and the same point must be considered when using other salts, otherwise the copper of the solution will be reduced by galvanic action)." Another authority says: "Boucherizing is injurious to the stay wires and bolts as the sulphur so quickly attacks not only the galvanizing of these, but the iron itself, that the stay wires of poles are soon eaten away." This shows that when salts are used for impregnating wood, iron bolts and nails should be protected in some way — by paint, say. Kyanising (chloride of mercury) is equally injurious to iron. Another process for preserving wood from decay is Beer's process in which *borax* is used. It is supposed to neutralize the decaying vegetable matter in the wood, and is also a very good, non-inflammable solution. We have entered thus fully into the methods of preparing wood with sulphate of zinc, chloride of mercury, and sulphate of copper in particular, because whatever may be the non-inflammable solution selected as most suitable, some such method of injection will be necessary if the impregnation is required to be other than merely superficial, in which case the same considerations would apply. Moreover, since all the three above-mentioned are salts, they will not only preserve the wood against rot, the influence of the weather, insects, and worms, but will render it also to a certain degree non-inflammable, but which non-inflammable solution is best we shall probably be better able to judge farther on. But we should, to begin with, put chloride of mercury and sulphate of copper out of the question, as the first is too expensive, and when burnt is turned into vapor which has a fearfully suffocating effect on the nose. Sulphate of copper, though cheap and free from this disadvantage, would turn the wood a blue color when the surface is damp with the moisture in the air. Chloride of zinc and borax, the other two of the above-mentioned processes, both preserve from decay and flame, and might be used for injecting green timber.

But at present let us go through the information that can be gathered on the subject of non-inflammable compounds and solutions. Much of this relates to rendering fabrics non-inflammable, and this is done by steeping them in almost any saline solution. Thus cotton and linen stuffs prepared with a solution of borax, phosphate of soda, phosphate of ammonia, alum, or sal-ammoniac do not suffer active combustion nor burst into flame. The salts act by forming a crust of incombustible matter on the surface of the fibres. They do not, however, prevent carbonization taking place when the temperature is sufficiently high. The cotton thread is reduced to a cinder when burnt; but from the action of the salt, its fibres still retain sufficient tenacity to support a light weight. The addition of one ounce of alum or sal-ammoniac to the last water used to rinse a lady's dress, or a less quantity added to the starch to stiffen them, renders them non-inflammable, or, rather, they will not readily take fire, and if kindled, are slowly consumed without flame. None of the above are used for fine soft muslins, because they render the fabric harsh and destroy all its beauty. The salt which is found to answer all conditions most completely is tungstate of soda: steeped in a solution of twenty per cent of this salt, muslin in perfectly non-inflammable when dry, and the saline film left on the surface is of a smooth and fatty appearance like tallow, and does not interfere with the process of ironing. The non-fulfilment of this last condition completely prevents the use of many other salts, such as sulphate or phosphate of ammonia, which are otherwise efficacious in destroying inflammability. The addition of a little phosphoric acid or phosphate of soda is recommended to the tungstate, for without this a portion of the tungstate is apt to undergo a chemical change and become comparatively insoluble. For a solution of tungstate of soda of minimum strength, dilute a concentrated solution of neutral tungstate of soda to specific gravity, one-fourteenth, and then add three per cent of phosphate of soda. This solution is found to keep and answer its purpose well. Again, in "*Ure's Dictionary:*" "Cotton and linen cloth may be best rendered incapable of burning with flame by being imbued with a solution of sal-ammoniac or of alum." Tomlinson says: "Experiments were tried with forty salts, but out of these only four appear to be applicable to light fabrics, namely, phosphate of ammonia, chloride of ammonium (sal-ammoniac), sulphate of ammonia, and tungstate of soda. The sulphate of ammonia is the cheapest salt, but causes brown spots on the muslin when ironed, and dissolves in water, so that it requires to be renewed after every washing. Tungstate of soda is the only one that does not interfere with the ironing, and consequently is that usually adopted.

"The oxides of tin withstand both the water and the soap, but they impart a yellow tinge, consequently their application has been restricted to canvas, sails, and other coarse materials (and would not affect their use with woods). This is also the case with borate and phosphate of protoxide of tin and arseniate of tin. These last are some of the attempts which have been made to fix some of the non-soluble compounds in textile fabrics. The method of rendering a sailcloth perfectly non-inflammable is to soak the canvas for two days in a protochloride of tin solution of the strength of two parts of the salt to one of water, and to leave it for a day in a concentrated solution of stannate of soda or carbonate of soda. The canvas is lastly dried, and is then ready for use." Also, we find in the "*English Cyclopædia*": "Cotton and linen fabrics may be partially protected from fire by a solution of alum or common salt; but alum weakens the fibres, and the salt makes them harsh and crisp. Borax will exert a considerable preservative effect; but the material is weakened,

[1] A paper read before the Civil and Mechanical Engineers' Society on Wednesday, April 22. By Thomas Manson Rymer-Jones, M. Inst., C. E., F. R. G. S., and John Rymer-Jones, Memb. Inst. Tel., Eng. Reprinted from the *Building News*. Continued from page 258, No. 492.

as with alum. It was found that phosphate of ammonia exerts the preservative effect; but the salt becomes decomposed under the laundress's iron. Sulphate of ammonia (only quarter the price of its predecessor) had most of its merits, but the same defect. Tungstate of soda has all the advantages, and is free from the disadvantages." So much for fabrics. Of course, what would be a disadvantage for linens need not be so for woods; but I give the above as an addition to our list of non-inflammable solutions, to guide us to the selections of the most suitable ones hereafter. The "*English Cyclopædia*" says, with regard to wood: "Many methods have been devised for making woods more or less fire-proof. The substance which is attracting most notice now is silicate of soda. Mr. Abel, chemist to the War Department of England, and Mr. Hay, chemist to the English Admiralty, made experiments on this salt is 1857. A portion of a wooden hut was painted three times inside and out with a solution of silicate of soda; but unfortunately for the fairness of the experiment, the building was constructed with a double boarding, so that it was only possible to coat or impregnate each plank on one side; but the value of the silicate was established beyond a doubt. A flame from a large heap of shavings placed against this part of the building for some minutes only succeeded in catching the end of one plank, and even that did not blaze, but only smouldered for a short time. By the heat of the fire the salt was drawn to the surface of the wood, and formed a glaze upon it. Subsequently, when the main body of the hut was destroyed by the fire, after several unsuccessful attempts to extinguish it by Philip's Fire Annihilator (for testing the efficacy of which the experiment was made, the silicate of soda experiment being only a secondary one), although the fierceness of the flame was such that few materials could have withstood it, yet several planks remained of the exterior coated portion. Upon examining the planks the unprotected surfaces were found to be completely charred, but this charring only extended to those parts which had not been touched by the silicate. Asbestos paint has been used with nearly similar results. So far as experiment has gone silicate of soda appears the most convenient and effective known for the purpose."

Again, respecting silicate of soda, "*Spon's Workshop Receipts*" says: "Deal boards become almost incombustible when painted over with a diluted solution of silicate of soda, called also glass-water. The glass-water is generally sold as a thick fluid like honey. This may be thinned out with water six or seven times its own bulk; the water must be soft, or boiled water will do, and the solution applied warm. In about twenty-four hours apply a second coat, and perhaps a third. Use a new brush and wash the brush in clean water after using, or it will get too soft. Avoid grease or fat on the boards before painting them." In the same book is another receipt as follows: "Soak the wood in a strong solution of alum and sulphate of copper — about one pound alum and one pound sulphate of copper should be sufficient for one hundred gallons of water. These substances are dissolved in a small quantity of hot water, then mixed with the water in the vessel in which the wood is to be steeped. The timber to be rendered fireproof can be kept under the liquor by stones, or any other method of sinking it. All that is required is a water-tight vessel of sufficient dimensions to hold enough of the liquor to cover the timber, which should be allowed to steep for four or five days; after this it is taken out and allowed to dry thoroughly before being used." This would be a very good plan to adopt with the upright timbers after thoroughly injecting them by the system of Boucherising, as before explained, whilst the timber is green. As the Japanese use their wood plain, the blue sulphate of copper tinge would hardly do for the lighter wood-work. With regard to Burnettizing sulphate of zinc, which, as before mentioned, has been largely used as a preservative against decay, there is no reason why it should not be used for every part of the wood in a house, injecting it whilst the wood is green, as it acts chemically on the sap, and is white. Sir W. Burnett says of it, that it renders the wood non-inflammable. The following is extracted from his pamphlet on the subject: "For preserving timber, canvas, cordage, and woolen things from dry-rot, mildew, moth, and the destructive influences of the elements, salt water, so far from hastening decay or neutralizing its effects, has, on the contrary, the quality of increasing its efficacy; it is perfectly innocuous and cannot endanger health. All the timber and ceilings of a ship may be impregnated with the solution without the slightest prejudicial effect on the crowded inmates. It retards the oxidization of metals, as has been proved repeatedly upon copper and iron bolts with the most satisfactory results, and articles prepared with this solution will resist combustion in proportion to the strength of the solution used." Again, another method: "In Maughan's process dry wood is saturated with an aqueous solution of phosphate of soda and muriate or sulphate of ammonia. A decomposition ensues, followed by an evolution of ammoniacal vapor and the formation of an incombustible coating on the surface of the wood." Jackson's patent consists in the application of a solution of salts of zinc and ammonia. Mr. Payne's wood-preserving process is well known. Wood is rendered fireproof by means of a solution of sulphuret of barium or calcium. The wood or other vegetable matter is put into an air-tight vessel from which the air is driven out by means of steam. The steam is condensed by the injection of the solution of the sulphuret, and by the application of cold water to the outside of the vessel. A partial vacuum being thus obtained, the solution is allowed to flow into the vessel from the tank containing it through a pipe furnished with a stop-cock. The stop-cock is then closed, and an air-pump connected with the vessel is worked until as perfect a vacuum as possible is obtained within the vessel. The cock is then again opened to allow the solution to fill the vessel nearly. It is then shut, and by means of a force-pump a further quantity of solution is introduced until the pressure on the interior of the vessel amounts to one hundred and ten pounds to one hundred and forty pounds per square inch. This pressure is maintained for an hour and the solution is then drawn off. The vegetable matter is then impregnated in a similar manner with an acid or a solution of some substance, such as sulphate of iron, which will unite with the barium or calcium, and set the sulphur free. When the vegetable matter is to be impregnated with a large quantity of solid matter it should be dried between the application of the two fluids. By this means an insoluble sulphate of lime or sulphate of barium is formed in the body of the wood, which is thus rendered nearly as hard as stone. Wood so prepared is now largely employed in English public works and railways.

Of this same process Payne himself says: "By impregnating wood with a solution of metallic oxides, alkalies, and earths in various proportions, using exhaustion and pressure to do it, and then in order to prevent the disunion of such solutions by introducing another solution by a similar means, an insoluble substance is formed in the interstices of the woods. Wood subjected to this process is not only proof against wet and dry rot in every situation, but will not communicate flame, and will resist the attacks of insects. The most porous, the softest, and, of course, the cheapest woods are rendered equal in point of usefulness, durability and strength to the hardest and best description of timber. Wood thus prepared is susceptible of the finest polish. As a preventative to the spread of flame, especially in countries where the houses are for the most part composed entirely of wood, and in most cases covered with wood shingles — the use of this process will be of the utmost importance, and will greatly lessen, if not entirely prevent, the dreadful catastrophes so frequently occurring there from fire. For all outdoor work, to whatever inclemency of weather it may be exposed, the advantages are great, and also for sleepers and other works on railways, as also for wood pavement. For canvas and cordage, by the proper application of this process, all the advantages named are communicated without injury to their elasticity. Sails, rigging of ships, canvas for tents, tarpaulings, etc., are by this means effectively protected and improved.

Again, "*Herbert's Encyclopædia*" says: "Many ingenious experiments have been resorted to to render wood fire-proof. Solutions of muriate of ammonia, muriate of soda, sal ammoniac, borax, alum, and several other salts and alkalies have this property to a certain extent. Professor Fuchs invented a solution for this purpose — ten parts potassa or soda, fifteen parts of pure silicious earth, and one part charcoal, mixed with water. This composition, applied to the surface of the wood, forms a vitreous coat, which effectually resists the action of fire. Decisive experiments fully established the efficacy of this plan, and the Royal Theatre of Munich was protected by the application of this composition. The surface covered was upwards of four hundred thousand square feet, and the expense, it is said, did not exceed five thousand francs — two hundred pounds, or less than four shillings for four hundred square feet. The following is an English composition for a like purpose: One part, by measure, of fine sand, two parts of wood ashes, and three parts slaked lime ground together with oil, and laid on with a painter's brush; the first coat thin, and the second thick. This forms a very strong and adhesive compound which is both fireproof and waterproof. Again, Solomon's patent consists in a peculiar application of two solutions to the surface of the wood, the first consisting of sulphate of alumina, glue, and water, and the second of chloride of calcium, glue, and water." Also in "*Spon's Workshop Receipts*": "A wash composed of lime, salt, and fine sand, or wood ashes, put on in the ordinary way of whitewash, renders a shingle roof fifty-fold more safe from fire from falling cinders in case of fire in the vicinity. It has also a preserving influence against the effect of the weather. The older and more weather-beaten the shingles the more benefit derived. Such shingles are generally more or less warped, rough and cracked. The application of the wash by washing the upper surface restores them to their original or firm form, thereby closing the space between the shingles and the lime and sand; filling up the cracks prevent it from warping. By the addition of a little lampblack the wash may be made of the same color as old shingles, and thus remove the offensive glare of a white-washed roof."

Such is the information we are able to gleam so far; and before offering any suggestion of our own as to the best mode of proceeding let us remember that to season timber in the ordinary way requires seldom less than three years', often six or eight years', exposure to the air freely; and though (owing to suffocating fumes emitted when exposed to great heat) Kyan's (chloride of mercury) is out of the question for us, still by the Burnettizing (chloride of zinc), Boucherizing (sulphate of copper), and Beerizing (borax) systems the destructive principle (sap) is dried and rendered inert. They render larch, firs of all kinds, willow, birch, elm, beech, ash, poplar, etc., of considerable value for durable purposes. We would, therefore, suggest for houses already built: Apply several washings of silicate of soda to the fixtures of every description, and let the removable lighter work, roof shingles (when used), mats, etc., soak several days in the same solution. Where shingle roofs are used, let these be afterwards coated with lime, salt and fine sand, or wood ashes. When new houses are to be built, impregnate the main or thick timbers thoroughly with chloride of zinc by pressure, obtained as in Boucherizing, whilst the timber is green; allow it to dry thoroughly before fixing, and paint the

outside with silicate of soda three times when in position. The ligher woodwork, shingles, etc., can be cut from large balks thus impregnated, and afterwards washed superficially with silicate of soda; or this thin wood-work may be saturated by steeping in silicate of soda for several days. By the use of the above comparatively simple and inexpensive remedies, all complicated steam-pressure paraphernalia, vacuum pumps, etc., are avoided. The area of fires would be greatly reduced, whilst a scheme of fire assurance would become feasible where these precautions were taken by the inhabitants of any block of buildings, as any spread of a conflagration would be arrested and kept in check at such a small loss to the outside houses of the block as would fall lightly on any company holding an assurance on the whole block. The inhabitants of any block of houses might assure against fire amongst themselves, on condition that the above precautions were observed by all, whilst any jealousy on account of vested interests of firemen might be met by paying a certain sum to be approved by former statistical returns, to fire brigades, and deducting according to the number and extent of fires, not to pit any district fire brigade against another for a prize, as that would only lead to a prevalence of fires (accidental, of course,) in opposing districts.

THE NEW OBSERVATORY DOME AT NICE.

THE observatory cupola, or movable dome, which has just been completed in some big shops out at Lavallois Perrier, is said to be the largest work of the kind ever constructed. This I was told a fortnight ago, and yesterday I went out to Lavallois — a suburb of Paris, just beyond the walls — to see it for myself. I do not know that this is the biggest movable cupola ever built, but it certainly is enormous. The history of its construction is interesting.

Four years ago, the Minister of Public Works organized a competition for the construction of a new cupola for the Paris Observatory. The one which now crowns the astronomical tower of that institution was constructed according to a design prepared by the famous astronomer Arago, but it is not large enough to contain the enormous telescopes which are at the disposal of astronomers to-day. Nor can it be manœuvred as easily or as rapidly as is desirable. Naturally, the problem to be solved in the construction of an observatory cupola is not only to make it large enough to contain the various instruments used in studying the heavens, but also so that astronomers can follow the movements of stars, some of which arise on one horizon in the evening to set at the opposite side the next morning. Telescopes are pointed at stars through a slit which extends from the top to the bottom of one side of the cupola, and as the cupola is so arranged that it can be turned on its axis, it is possible to direct telescopes to any desired quarter of the heavens. The Arago cupola at the Paris observatory is thirty-nine-and-one-half feet in diameter, and rests on iron wheels or rollers. One evening at the Paris observatory I noticed that it took eight men to manage the ropes and windlass by which it was turned, and it gave them all they could do to get it to make one complete revolution in forty-five minutes. When the great comet paid us a visit three years ago, I was one of a party who were invited to the observatory to take a look at it through a big telescope, and, on that occasion, I noticed that the eight men had been superseded by a small gas-engine, with which it was possible to get the cupola around in ten minutes; but even this is not as quick as the astronomers would like, and a gas-machine not only takes up a great deal of room, but its motion is apt to jar delicately-adjusted instruments in the tower.

For the new cupola of this old observatory seven plans were sent in to compete for the prize offered by the minister. Six were nothing more than modifications of the Arago cupola, but the seventh was founded on an entirely new principle. Its architect is M. Eiffel, a mechanical engineer, the same who projected an iron tower nine hundred and eighty-five feet high, which, if constructed, will be one of the features of the Universal Exposition to be held here in commemoration of the Centennial of the Revolution of 1789. His project for the observatory cupola is founded on the Archimedean principle that a body loses in water a portion of its weight equivalent to that of the water which it displaces. Supposing that a cupola weighed one hundred tons, M. Eiffel proposes to support it by means of floaters on the surface of a ring-shaped tank large enough to contain four hundred and fifty thousand gallons of water; the floater thus forms a circular boat, so to speak, without prow, keel or stern, and, in order to make it turn on its axis, it would only be necessary to provide sufficient power to overcome the very trifling resistance presented by the water. This project was so new, so bold, and so simple, that it frightened a majority of the experts to whom the minister had referred the awarding of the prize, four out of the seven members of the jury voting against it. They reported that the reasons which impelled them to do this were that they saw no way to prevent the rusting of the tank and floater; that, even if it were possible to construct such a cupola, it would be impossible when once built to take it down for repairs, and that such a large floating mass would never be able to resist the force of the winds to which it would be exposed. The other three experts reported favorably on Eiffel's project, and one other, Admiral Monchez, superintendent of the Paris Observatory, was so favorably impressed with it that he succeeded in getting the minister to adopt it as the one for the new cupola — a decision, by the way, which did not do the inventor much good, for, though it was made four years ago, the lack of appropriation has prevented it from being carried into effect.

Another member of the jury who was also satisfied that Eiffel's project was an entirely feasible one was M. Charles Garnier, the architect who built the Grand Opera-House in this city, and it so happened that he was then preparing plans for the erection of an observatory of which a wealthy Jew by the name of Bischoffsheim had made a present to the town of Nice. M. Bischoffsheim had told Garnier that he wanted to build an observatory which would be bigger and better arranged than any existing institution of the sort, and when the architect told him about the Eiffel cupola the rich banker authorized the construction of one upon that principle for the tower of the Nice observatory. It was this cupola that I went out to see at the workshops where it has been put together and is now undergoing severe tests. It is an iron affair throughout. The cupola floats, as I have already said, in a tank filled with water. This round tank has two walls; from the inner to the out ring or wall is a distance of three feet ten inches (one-and-one-fifth metres), and the depth between them is one-and-one-half metres — that is to say, a little more than five feet. The diameter or distance across the inside of the tank is seventy-three feet (twenty-two-and-four-tenths metres). The cupola cover which is to inclose the telescope and other astronomical apparatus has a diameter at the base of a trifle more than seventy-three feet, and its highest point is seventy-six-and-one-half feet. Its base rests on what is called a floater; this is also of iron, and is of very nearly the same dimensions as the ring-shaped tank. It sets down into the opening between the circular sides, than which it is twenty-five centimetres narrower. From this floater rise sixteen steel stanchions, bowed to form the ribs of the cupola, and dividing it into so many equal segments. On these ribs are laid six hundred and twenty sheets of steel; each sheet is one-and-one-half millimetres thick, and they are fastened together by fifty-five thousand rivets. The whole floating mass weighs ninety-five tons, and it with the tank in which it swims is of the same size as the tower of the observatory building on top of which it is to be placed. Pure water will not be used, as in cold weather that would freeze too quickly, and moreover it would soon rust the iron: forty-one thousand five hundred gallons of a strong solution of chloride of magnesium will be used instead. This liquid will not freeze even when the mercury is fifty degrees below zero, Centigrade, a degree of cold unknown in France. Being one-fourth denser than pure water, there need not be so much of it, and it does not eat the iron. One man with a single windlass can cause this floating cupola to make a complete revolution inside of four minutes.

The opening through which the telescopes are to be pointed is closed differently from that of the Paris observatory, where it is shut by means of trap-doors so heavy that it takes two men to move them. In the Eiffel cupola the opening is closed by two blinds, sliding on iron rails each five feet wide, thus making, when pushed apart, a gap of ten feet extending from top to bottom of one side of the dome. These sliding blinds can be handled by one man. The equatorial which this dome is to contain is said to be the largest of its kind in existence. French astronomers say so, and they may be speaking truthfully for all I know. It is a telescope undoubtedly of great power. The object and the occular glasses are eighteen metres, or precisely fifty-nine feet apart; the diameter of the object glass is seventy-six centimetres, or twenty-nine-and-three-fourths inches. It was ground and polished by Feil of Paris, and the Henry Brothers are now testing it at the observatory.

Next week all this iron work will be taken down and shipped to Nice. Thence the several parts will be carried to the observatory and put together again. There at the top of Mont Gras it will tower up amid the solemn silence of rocks and forests, in the presence of two of the most sublime landscapes that nature has ever prepared for man's contemplation — on the one side, the orange groves, towns, villages and villas encircling the Mediterranean which stretches out like a vast blue mirror in the dazzling sunlight, on the other, the plains of Provence, and, in the distance, the long line of Alps with their snowy peaks. Under the cover of this cupola the astronomers of the Nice observatory will continue their researches amid the abysses of the heavens which have already been rewarded by so many astronomical discoveries. With the aid of the instruments the observatory already possesses, M. Perrotin, the superintendent, and his assistant astronomers, M. Charlois and M. Thollen, have carefully studied, examined and measured the double stars and planets of our solar system, and by means of an ingenious apparatus invented by M. Thollen, they have penetrated the secret of the chemical constitution of the sun. With the aid of this apparatus a solar spectrum of forty-five feet in length can be obtained, in which are more than ten thousand spectral lines, most of them being the same as those cast by the elements that exist on this planet. By comparing these solar and terrestrial lines, science obtains a knowledge not

only of the elements existing in the sun, but is led to make the discovery of elements the presence of which on our earth was not thitherto suspected. By reason of its exceptional location, the excellence of its instruments, and the skill of its astronomers, the Nice observatory, although not yet fully complete and equipped, has obtained quite a reputation throughout the scientific world. Its formal inauguration will take place next October in the presence of a geodetic congress which will be held during that month.

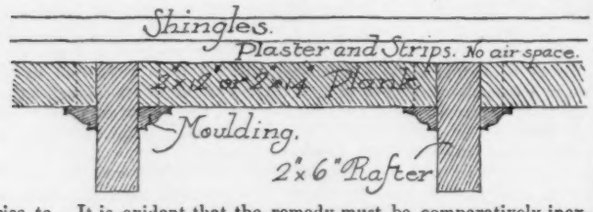
The gentleman who is responsible for this great work which thus crowns the Alpes-Maritimes is named Raphael-Louis Bischoffsheim, and he is one of the financial kings of the French republic. His father, Louis Raphael, was a Mayence Jew. Tired of living a poor man in his native town, he drifted off to Amsterdam, where others of his race had preceded him. Three years after his installation in that old Dutch town, Raphael's wife was delivered of a son, the same who to-day holds high rank as the friend of astronomers. For a while old man Bischoffsheim had a rather hard time of it, but one day he thought of Constantinople, and thither he went in search of fortune. Not long after his arrival at the Turkish capital an idea struck him which turned out to be a real stroke of genius. In those days, more so than now, coins of all nations circulated in Turkey, but the government reserved the right of fixing what moneys should be legal tender in payment of taxes. One day Bischoffsheim went to the Grand Vizier and proposed that they should go into partnership. The Jew was to make a corner in the coinage of certain nations, and when he had got them all in his possession the Turkish official was to direct that that sort of money and no other would be acceptable to the tax-collectors. The operation panned out well, and was repeated so often that both Jew and Mahommedan made millions out of it. This was the origin of a fortune which, along about 1850, Bischoffsheim transferred to Paris; here he opened a banking-house, and took out naturalization papers for himself and his son. He managed to have a finger in most of the good speculations that were got up at the bourse, and, after a while, set up as a protector of art and actresses. One day he thought he would like a stage of his own, which he contemplated converting into a sort of unofficial conservatory, and so he dug a hole in the ground and built a theatre around it which he called the Théatre de l'Athénée; on top of the theatre he built a hotel, and thus got square for the loss which the one house occasioned him by charging a big rent for the other. This was in 1866, and, until two years ago, travellers who put up at the Hôtel de l'Athénée ran nightly danger of being burnt alive if the theatre should happen to take fire. The chief of police finally decided that the building was unsafe, and forbade its being used as a theatre any longer. The old man gave away a great deal of money, and was always in hopes that his charity would cover up the stains on his Turkish piastres. In this he was so successful that when he died the papers all spoke of him as "the wealthy banker and great philanthropist." His son continued the banking business, but one day he got very badly caught in Honduras railroad bonds, and since then he is careful what he does in a speculative way, and never acts in large affairs without the advice and coöperation of his father-in-law, Baron Erlanger. He goes in for science and politics strongly, however, and perhaps one reason why he built the observatory at Nice was that he knew it would get him elected to the Chamber as deputy for the Alpes-Maritimes. The observatory is entirely his own work; he has spent several million francs in the purchase of ground, erection of buildings, equipping it with instruments and providing an endowment for the support of the personnel. Such acts of public spirit are very rare in France, where the idea that it is possible to do anything of this sort without governmental aid and management never seems to enter anybody's head. — *Henry Haynie in the Boston Herald.*

DESIRABLE CHANGES IN MODERN ROOFS.

New York, June 1, 1885.

Edward Atkinson, Esq.: —

Dear Sir, — Your article in the last *American Architect* has interested me very much. I do not think, however, that your suggestion for a "2″ plank roof plastered on the inside" is altogether feasible. Leaving out of consideration the fact that it is only capable of application in the simplest kind of roofs, there is a practical difficulty in applying plaster so as to form a solid body with the wood. At least, I am not aware of any method of doing this in a permanent manner. I agree with you in condemning what you call "crazy" roofs, and have had frequent occasion to notice the heat-generating power in summer and the loss of heat in winter that our ordinary roofs give



rise to. It is evident that the remedy must be comparatively inexpensive before it can be advocated for our ordinary houses or "shingle palaces."

The roof of my own country cottage is made of shingles nailed to strips on the rafters. The attic, at present, is entirely unfinished. I want to finish it, and it occurred to me after reading your article that I might do it economically in the following manner: First, plaster the under side of shingles between the shingle strips, then fill in between the rafters with 2″ plank 14″ wide (this being the distance between rafters) running up to ridge line. To cover any possible cracks between the rafters and planking, put a moulding in the angle. I would leave the rafters and planking to show in the rough, applying perhaps a stain for finish. The cut shows what I mean.

If 2″ x 14″ plank could not be had, suppose I made it 2″ x 12″ and filled in 1″ on each side under the moulding with plaster?

I would be obliged to you for an expression of opinion on the above through the columns of the *American Architect.*

Respectfully yours, F. A. Wright.

Boston, Mass., June 4, 1885.

To the Editors of the American Architect: —

Dear Sirs: — In reply to the questions put to me by Mr. Wright I beg to say that I am very glad to find that my theory is so well sustained both by him and also by an article in *The Builder* of April on the expediency of adopting flat roofs. I have also learned that I have plagiarized from Charles Reade in the latter theory without knowing it.

With respect to the specific questions put to me by Mr. Wright, I reply that according to our mill experience there can be no question as to the plan which he proposes to adopt in his country cottage. If his shingles had been laid upon an ordinary boarded roof it would suffice to place inside boards lengthwise between the rafters, making a roof two inches thick aside from the shingles. This has been done in several factories where the old construction caused the roofs to be unsafe: namely, vertical sheathing cutting off the eaves and a horizontal sheathing making a cock-loft above. At our instance this sheathing has been removed, opening the attic throughout, and the same material has been screwed up between the rafters to the under side of the roof boards, so as to make the roof two inches or two boards thick. Attics which had been excessively cold in winter and excessively hot in summer before this change was made, have thus been made entirely useful and comfortable in both seasons.

With respect to the practical difficulty suggested by Mr. Wright in applying plaster so as to form a solid body with the wood, it would appear that Mr. Wright is not familiar with what is known in mill practice as "dove-tail lathing." Before wire-lathing had been introduced it was our practice to recommend the protection from fire of the ceilings of picker-rooms by plaster laid on "dove-tail lathing" on the under side of the plank between the heavy timbers of the next floor. The "dove-tail lath" is made thicker than the common lath, bevelled on each side and nailed snug to the plank; the bevels hold the mortar against any possible jar upon the floor above. Laths are sometimes made in the form of a button with a rather long shank, in order to accomplish the same purpose.

In reply to your own question as to the danger of "dry rot" in case wood is substantially cut off from actual contact with the air by means of plastering, or otherwise, I beg to say that this matter has received very close attention.

Very many years since the heavy timbers in the extension of the Mason & Hamlin Organ Company's works were protected with a thick coat of plastering laid on wire-lathing so close as to leave no air space on three sides of the timber, and a three-inch plank was laid over the top side as tight as it could be made, the plastering being continued between the timbers on the under side of this plank. The timbers were ventilated at the ends. About three years ago, at my request, a part of this plastering was removed; the timber was found perfectly sound and very fresh in appearance, especially where there had been an absolute contact with the mortar. Rough plastering appears to be sufficiently porous to permit the percolation of air and the evaporation of the moisture of green timber, in this respect entirely differing from paint. If a second or finishing coat of lime putty were added, it might be somewhat dangerous to the timber.

The danger of painting heavy timbers before they have had time to season is apparent, and yet it is a blunder frequently repeated.

My own personal experience happened many years since in a building constructed by a corporation of which I was treasurer. It was two hundred feet by one hundred feet, five stories high, divided into equal sections by a party-wall. One section was leased as soon as it was finished and the timbers were painted. The other section stood nearly three years unfinished, with timber entirely bare, and was then taken by the same parties who had leased the first section. While the finishing of the second section was going on the timbers were examined and found to be perfectly sound. Some suspicion, however, led to an examination of the timbers in section number one, which had been painted, and nearly every one of them had to be taken out, having been almost destroyed by having been painted before they were seasoned.

Yours very truly, Edward Atkinson.

A New Court-House for Sale. — Ten years ago the new Court-House, on Seneca Street, Cleveland, was built at great cost to the county. Since that time the mammoth structure has served only to furnish quarters for the Probate and Criminal Courts and Prosecutor's office. The old Court-House, on Monumental Park, has been enlarged, and the County Commissioners have now decided that the new Court-House, which always stood as a monument of extravagance and folly had better be sold. —*New York Times.*

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

318,452. VENTILATED SEWER-PIPE. — Michael J. Coholan, New Britain, Conn.

318,464. MITER-BOX. — Thompson E. Garusch and Thomas Jones, Viola, Wis.

318,472. ELECTRIC SIGNAL-BELL. — Chas. Henzel, New York, N. Y.

318,490. BRICK-KILN.— Thomas McNicholas, Memphis, Mo.

318,494. VENTILATOR. — Adolph Olsen, Boston, Mass.

318,495. LATHING - APPARATUS. — Stuart Perry, Newport, N. Y.

318,507. WINDOW COLD - AIR REFRIGERATOR. — Charles W. Roth, New York, N. Y.

318,508. AUTOMATIC FIRE-EXTINGUISHER. — Marcus Ruthenburg, Cincinnati, O.

318,528. DRAUGHTING-TABLE. —Henry C. Weeden, Boston, Mass.

318,561. RATCHET - DRILL. — Henry D. Hinckley, Hartford, Conn.

318,576. SASH-FASTENER. — Charles W. Nida, New York, N. Y.

318,578. MECHANICAL TRAVERSE - TABLE. — William D. Patterson, Savonas Ferry, British Columbia, Canada.

318,592. FRAME BUILDING. — Lewis W. Beard, Arcadia, La.

318,600. FIRE - ESCAPE. — William C. Cronemeyer, Pittsburgh, Pa.

318,626. TRUSS FOR ROOFS OF BRIDGES.—John H. Jones, Clio, La.

318,632. CHIMNEY-COWL.—Ira G. Lane, New York, N. Y.

318,647. ELECTRIC BELL. — Augustus H. Palmer, Utica, N. Y.

318,648. ANCHOR FOR BUILDINGS.— Frank D. Paradise, Memphis, Tenn.

318,661. FLOOR - COVERING. — Rudolph Schroeder, New York, N. Y.

318,684. KNOB-ATTACHMENT. — Charles H. Beebe, Norwich, Conn.

318,724. ROOFING-SHINGLE. — Giles Hall, East St. Louis, Ill.

318,736. WINDOW-SASH. —Chester J. Holmes, Stafford Springs, Conn.

318,743. AUTOMATIC FIRE-EXTINGUISHER.—James A. House, Bridgeport, Conn.

318,744. FIRE - EXTINGUISHER. — James A. House and Charles H. Dimond, Bridgeport, Conn.

318,749. CAP FOR CHIMNEYS AND SMOKE-STACKS. —Horace F. Keen, Philadelphia, Pa.

318,791. PAINT.—James P. Perkins, Pullman, Ill.

318,792. METHOD OF MAKING BRICK, ETC.—James P. Perkins, Pullman, Ill.

318,799. WINDOW - SCREEN. — Josiah K. Proctor, Philadelphia, Pa.

318,834. BURGLAR - ALARM. — A. Clarke Tonner, Canton, O.

318,842. WATER-CLOSET. — David Whiteford, Chicago, Ill.

318,870. WALL FOR REFRIGERATOR STRUCTURES. —Andrew J. Chase, Boston, Mass.

318,871. WINDOW-SCREEN. — George R. Clark, Dubuque, Iowa,

318,872. ROOFING AND SIDING-BOARD.—James W. Crabbe, Brooklyn, N. Y.

318,890. SASH-PULLEY. — Jacob D. Fyke, Los Angeles, Cal.

318,899. VALVE FOR WATER-CLOSETS, ETC.— Geo. Haydn, Baltimore, Md.

318,910. ROOFING FELT AND ITS MANUFACTURE. —Josiah Jowitt, Stanley, N. J.

318,912. VENTILATOR. — Friedrich Keller, Milwaukee, Wis.

318,935. WOOD-FILLER. — Samuel F. Woodhouse, Philadelphia, Pa.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—Since our last report thirty-five permits have been granted, the more important of which are the following:—

F. E. Yewell, 5 two-st'y brick buildings, e s Bruce Alley, n of Lanvale St.

C. A. Pindell, 5 two-st'y brick buildings, in rear of Mosher St., between Calhoun and Stricker Sts.; 5 two-st'y brick buildings, Calhoun St., between Tenant and Mosher Sts.; and 10 two-st'y brick buildings, n s Mosher St., n w cor. Calhoun St.

Jos. A. Eisenhardt, three-st'y brick building, n w s Gay St., between Mott and Aisquith Sts.

Trustees St. Gregory's Church, church-building, s w cor. Gilmor and Baker Sts.

M. Oppenheim, 2 three-st'y brick buildings, e s Pennsylvania Ave., between Biddle and George Sts., and 2 two-st'y brick buildings in rear.

J. Papplar, 5 three-st'y brick buildings (square), s s Baltimore St., s w cor. Choptauk St.

F. O. Singer, 8 two-st'y brick buildings, w s Carey St., between Patterson Ave. and Presstman St.

Jas. W. Tindall, three-st'y brick building, w s McKim St., n of Chase St.

McAfee Bros., 7 two-st'y brick buildings, e s Holbrook St., between Biddle and Preston Sts.

John Desch, three-st'y brick building, e s Charles St., cor. Oliver St.

John R. Bailey, 21 two-st'y brick buildings, e s Gilmor St., between Cole and Ramsay Sts.

Frederick Burger, 4 three-st'y brick buildings, e s Eden St., n of Eastern Ave.

L. Matthei, three-st'y brick building, n w cor. Hanover and Clement Sts.

Immaculate Conception Church, three-st'y brick building, n s Mosher St., between Druid Hill Ave. and Division St.

Benj. C. Bayne, 5 two-st'y brick buildings, w s Chester St., between McElderry and Monument Sts.

Boston.

BUILDING PERMITS. — *Brick.—Atlantic Ave., Nos.* 410 -414, Otis Wharf, mercantile, 47′ x 88′; owner, Mrs. A. D. Barnard; builder, Chas. Doyle.

Washington St., No. 783, cor. Hollis St., mercantile, 51′ 6″ and 53′ x 49′ 2″ and 53′; owner, David W. Foster; builder, H. B. Rankin.

Kartopp St., No. 12, cor. Reeds Ct., dwell., 24′ 6″ x 38′ and 41′; owner and builder, C. A. Wetmore.

Tremont St., cor. Tremont Ct., water-fountain, 15′ x 15′; owner, Silas Gurney; builder, E. R. Rand.

Wood. — Princeton St., Nos. 142, 144, 146 *and* 148, 4 dwells., 21′ and 22′ x 33′ and 42′; owner and builder, G. W. Hargrave.

Brooks St., Nos. 127 *and* 129, 2 dwells., 21′ x 33′ and 42′; owner and builder, G. W. Hargrave.

East Third St., near M St., dwell., 21′ x 33′; owner, J. L. Newcomb; builder, W. T. Eaton.

Dorchester Ave., near Bellour Pl., dwell., 19′ 6′ x 43′; owner, Mrs. A. H. McDonald; builder, Frank McDonald.

Dudley Ave., near Roslindale Ave., stable, 14′ x 20′; owner, John Kerrigan; builder, Joseph McDonald.

Fairview St., near South St., dwell., 21′ x 28′; owner, James Ryan; builder, Russell Park.

Ballinakill Ave., near Ashland St., dwell., 20′ x 23′; owner, John Higgins; builder, W. S. Mitchell.

Bainbridge St., near Kingsbury St., dwell., 22′ 8″ and 24′ x 54′ 8″; owner, Thomas Watson; builder, C. O. Dunn.

Brooklyn.

BUILDING PERMITS. — *Douglass St., Nos.* 897 *and* 899, 2 three-st'y brick tenements, tin roofs, wooden cornices; cost, each, $3,500; owner, John D. Ferguson, 917 Douglass St.; architect, Amzi Hill.

Third Pl., No. 12, s s, 140′ e Henry St., 2 two-st'y brown-stone dwells., tin roofs; cost, each, $4,000; owner and builder, Thomas Keogh, 149 Nelson St.

De Kalb Ave., No. 1213, n s, about 150′ e Bushwick Ave., two-st'y brick factory, tin roof; cost, $7,900; owner, T. De Witt & Son, 1211 De Kalb Ave.; architect, Frank Holmberg; builders, Ernst Loerch and John Rueger.

South Fourth St., No. 315, near Tenth St., four-st'y brick tenement, tin roof, wooden cornice; cost, $7,800; owner, Adam Schultz, 227 Grand St.; architect, Frank Holmberg.

Pacific St., n s, 150′ w Nostrand Ave., three-st'y brown-stone dwell., tin and slate roof; cost, $15,000; owner, George A. Betts, 1234 Pacific St.; architects, Geo. P. Chappell & Co.; builders, James Ashfield & Son and Morris & Selover.

Oakland St., Nos. 147, 147½ *and* 149, 3 two-st'y frame dwells., gravel roofs; cost, each, $2,500; owner, E. A Watken and J. Campbell; architect, Stephen Randall; builder, F. D. Sills.

Hart St., n s, 350′ w Marcy Ave., three-st'y brown-stone dwell., tin roof; cost, $9,500; owner, Chas. E. Watts, 64 Tenth St.; architect, E. F. Gaylor; builders, Matthew Smith and S. M. Weekes.

Myrtle Ave., s s, 325′ e Throop Ave., four-st'y brick tenement, tin roof; cost, $7,300; owner, B. T. Biffar, 516 Broadway; architect, E. F. Gaylor; builders, Mathew Smith and Jenkins & Gillies.

Water St., s s, 200′ e Jay St., 2 four-st'y brick tenements, tin roofs; cost, each, $6,000; owner, James Kerns, 114 Vanderbilt Ave.; architect, I. D. Reynolds; builders, Leahey & Moran and S. C. Whitehead.

Gates Ave., n s, 100′ e Reid Ave., 12 four-st'y brown-stone stores and dwells., tin roofs; cost, each, $9,000; owner and architect, Wm. Godfrey, 548 Monroe St.; builders, Wm. M. Gibson and Wm. Godfrey.

Conover St., n e cor. Sullivan St., four-st'y brick store and tenement, tin roof, wooden cornice; cost, $8,000; owner, William Woods, 240 Sullivan St.; architect and builder, C. M. Detlefsen.

Broadway, w s, 25′ n Stockton St., 2 three-st'y frame stores and dwells., tin roofs; cost, each, $3,900; owner and builder, George Loeffler, 78 Jefferson St.; architect, Frank Holmberg.

Broadway, w s, 65′ n Stockton St., three-st'y frame store and dwell., tin roof; cost, $4,000; owner and builder, Geo. Loeffler, 78 Jefferson St.; architect, Frank Holmberg.

Twelfth St., n s, 190′ w Seventh Ave., 3 three-st'y brick dwells., tin roofs; cost, each, $4,000; owner, A. G. Calder, 312 Twelfth St.; architect, Wm. M. Calder; builders, Jno. Wyeth and A. G. Calder.

Lafayette Ave., s s, 150′ w Clason Ave., two-st'y brick factory, gravel roof; cost, $4,000; owner, Edw. J. Hewitt, 49 Beekman St., New York; architects, Parfitt Bros.

Lafayette Ave., No. 1113, two-st'y and basement brick dwell., tin roof; cost, $6,000; owner, Mrs. Mari Ohle, 1021 Broadway; architect, H. Vollweiler; builders, George Cutler and H. Stocks.

South Ninth St., n s, 65′ w Eighth St., 3 four-st'y brick and brown-stone tenements, tin roofs; cost, each, $13,000; owner, E. Smith, Bedford Ave.; architect, W. H. Gaylor; builder, T. Gibbons.

Henry St., s e cor. Orange St., three-st'y and basement brick and brown-stone tenement; cost, $27,000; owner, Thomas Schloerb, 91 and 93 Orange St.; architect, E. W. Greis; builder, J. Thatcher.

Greenpoint Ave., s s, 75′ e Newell St., one-st'y frame depot and stable, gravel roof; cost, $5,000; owners, Calvary Cemetery and Greenpoint Railroad; architect, C. L. Smith; builders, G. & A. Langer.

South Fifth St., No. 79, n s, 75′ w Third St., four-st'y brick tenement, tin roof; cost, about $8,500; owner, W. R. Bell; architect and builder, C. A. Mushlit.

Greenpoint Ave., n s, *Nos.* 83 *to* 121, 21 four-st'y brick stores and dwells., gravel roofs; cost, each, $9,000; owner, James R. Sparrow, Greenpoint, L. I.; architect, E. B. Ackerly; builder, J. B. Woodruff.

President St., No. 825, 206′ w Eighth Ave., three-st'y brick dwell., tin roof; cost, $16,000; owner, Julia E. Woodford, 67 Cambridge Pl.; architect, H. O. Avery; builders, C. Cameron and W. S. Wright.

Leonard St., e s, 125′ n Calyer St., 2 three-st'y frame tenements, gravel roofs; cost, each, $9,500; owner, S. M. Saunders, Leonard St.; architect, F. Weber.

Gates Ave., n e cor. Sumner Ave., 6 four-st'y brick stores and tenements, gravel roofs; cost, each, $9,000; owner, M. E. Hall, 63 Patchen Ave.; architect, T. S. Godwin.

Kent Ave., e s, 25′ n Kosciusko Pl., three-st'y brick tenement, tin roof; cost, $5,500; owner, Thos. McCoy, on premises; architect, R. Dixon; builder, F. Fagan.

Manhasset Pl., e s, 110′ s Rapalyea St., 2 two-st'y brick dwells., tin roofs; cost, each, $3,000; owner, James Campbell, 6 Tiffany Pl.; architect, F. Ryan.

Chicago.

BUILDING PERMITS. — P. Popp, three-st'y store and dwell., 558 Halsted St.; cost, $12,000.

L. Strassheimer, two-st'y dwell., 1010 North Halsted St.; cost, $3,000.

J. Kohler, two-st'y dwell., 3009 Portland Ave.; cost, $2,500.

H. McGarrey, two-st'y dwell., 623 Harrison St.; cost, $2,600; architect, J. C. Zarbel.

F. Norotny, four-st'y stores and flats, Blue Island Ave. and Nineteenth St.; cost, $20,000.

M. Rech, three-st'y dwell., 240 Oak St.; cost, $7,000; architects, Schaub & Berlin.

T. Hoffman, basement, 115 Clybourne Ave.; cost, $2,500.

J. H. Doiz, two-st'y dwell., 465 Warren Ave.; cost, $2,800.

L. P. Smith, two-st'y dwell., 27 Bellevue Pl.; cost, $10,000.

M. Jalovy, two-st'y dwell., 102 Wesson St.; cost, $3,500.

Mrs. Trapp, two-st'y dwell., 28 Burling St.; cost, $4,000.

E. Deslefano, three-st'y store and dwell., 199 West Taylor St.; cost, $4,000.

Mrs. E. L. Potwin, three-st'y dwell., 391 Dearborn Ave.; cost, $7,000; architect, W. L. B. Jenney.

O. Cobb, alterations Hershey Music Hall, 81 to 87 Madison St.; cost, $15,000.

Mrs. C. Sperry, three-st'y flats, 307 Larrabee St.; cost, $3,500.

S. E. Barrett, 2 two-st'y dwells., 745 to 747 North Clark St.; cost, $12,000; architect, W. L. B. Jenney.

Wood Bros., three-st'y flats, 18 Twenty-sixth St.; cost, $3,500.

M. Gebel, three-st'y flats, 206 Rush St.; cost, $4,500.

Mrs. H. Cohn, three-st'y store and flats; cost, $9,000; architect, A. Bresler.

Geo. Birkhoff, Jr., two-st'y dwell., 575 West Adams St.; cost, $8,500; architect, J. F. Warner.

C. Gerhrke, four-st'y store and dwell., 453 Wells St.; cost, $5,500; architect, Schnoor.

W. H. Brett, three-st'y flats, 31 Adams St.; cost, $6,000; architect, J. Van Osdell.

L. & S. J. Arado, three-st'y store and flats, 84 Sherman St.; cost, $10,000; architect, W. F. Carroll.

Mrs. M. J. Harwood, 2 two-st'y dwells., 1919 Indiana St.; cost, $8,000; architect, W. A. Furber.

M. J. Chalmers, three-st'y dwell., 234 Ashland Ave.; cost, $20,000.

Thos. Meyer, four-st'y store and flats, 1029 Milwaukee Ave.; cost, $6,000; architect, C. P. Hanson.

N. P. Smith, 6 two-st'y dwells., 3237 to 3255 Cottage Grove Ave.; cost, $21,000.

R. Lancaster, three-st'y store and flats, 3269 Cottage Grove Ave.; cost, $6,000; architect, W. A. Furber.

St. Luke's Church Mission House, two-st'y Mission house, 388 Western Ave.; cost, $2,700.

O. B. Taft, one-and-one-half-st'y dwell., 3014 Michigan Ave.; cost, $7,000; architects, Wheelock & Clay.

Chas. Gehrke, two-st'y store and dwell., 139 Fullerton Ave.; cost, $5,000.

A. Kalb, three-st'y store and dwell., 485 West Madison St.; cost, $8,000.

C. Schroeder, 4 cottages, 997 to 1005 Hinman St.; cost, $4,000.

J. Wenzeler, two-st'y dwell., 3531 Dearborn St., cost, $4,000.

Wm. Flagg, two-st'y rear addition, 1 Woodland Pk.; cost, $3,000.

J. Heiland, three-st'y dwell., Michigan Ave.; cost, $12,000.

J. Totzke, 2 two-st'y stores and flats, 688 to 690 West Chicago Ave.

J. O. Callaghan, two-st'y flats, 683 Fulton St.; cost, $3,500; architect, C. Isaacson.

Cincinnati,

CHAMBER OF COMMERCE. — The competition for the new Chamber of Commerce closed on June 1, and fourteen sets of plans were received from which that of Mr. H. H. Richardson, of Brookline, Mass., has been selected for execution.

BUILDING PERMITS. — Richter & Co., four-st'y brick building, Ninth and Main Sts.; cost, $8,000.

Cincinnati Music Verein, four-st'y brick building, Twelfth and Walnut Sts.; cost, $20,000.

E. B. Meiner, four-st'y brick building, Vine and Marcy Sts.; cost, $4,600.

C. G. Vangandt, two-st'y brick building, 165 Barr St.; cost, $3,000.

F. Berger, three-st'y brick building, 80 Pleasant St.; cost, $3,000.

Wm. Gleme, four-st'y brick building, 266 West Fifth St.; cost, $3,500.

M. Warth, three-st'y stone front, Richmond and Cutler Sts.; cost, $10,000.

Mrs. J. Foster, four-st'y brick building, 268 West Fifth St.; cost, $12,000.

Total, $70,100.
Repairs, $12,010.
Total amount to date, $1,128,610.
Total permits to date, 340.

Cleveland.

BUILDING PERMITS.—E. Quimby, brick block, Euclid cor. of Willson Ave.; cost, $50,000; A. M. Smith, architect; King & Grant, contractors.

Chas. Body, brick block, cor. Perry and Garden Sts.; cost, $11,000; Dantel & Giel, contracters.

Mr. Bruml, brick store and dwell., Garden St.; cost, $7,000; Uhl & Koestering, contractors.

L. F. & S. Burgess, brick block, Huron St.; cost, $35,000; J. M. Blackburn, architect; Thos. Simmons, contractor.

Atwater Estate, brick block, South Water St.; cost, $60,000; Brooks & Co., contractors.

Mr. King, brick block, Euclid Ave.; cost, $60,000; G. H. Smith, architect; Thos. Simmons, contractor.

Jacob Perkins, stone-front building; cost, $15,000; S. C. Kane, builder, Coburn & Baum, architects.

Thos. Lanter, brick block, Superior St.; cost, $50,000; Coöperative Building Co., builders; Cudell & Richardson, architects.

Addition to Stillman Hotel; cost, $45,000; Mr. Alexander, builder; A. Kochler, architect.

High Service Pumping Station for Cleveland Water Works (stone); cost, $90,000; John Whitelaw, superintendent and engineer; F. C. Bate, architect; A. Dall, Jr., contractor.

Miller & Rouse, brick block, Frankfort St.; cost, $14,000; S. C. Kane, builder; Levi Scofield, architect.

Infirmary Building; cost, $35,000; John Eisenman, architect.

F. C. Bate, frame dwell., Kennard Ave.; cost, $2,900; Flora & Hill, builders; F. C. Bate, architect.

Kansas City, Mo.

BUILDING PERMITS. — E. Allison, three-and-one-half-st'y brick business block, 50′ x 110′, 1400 and 1402 Grand Ave.; cost, $22,700.

Peter Soden, three-and-one-half-st'y brick business block, 50′ x 112′, 12 to 22 East Eleventh St.; cost, $25,000.

E. C. Coleman, brick dwell., Central St.; cost, $3,500.

E. O. Moffat, brick dwell., Troost Ave.; cost, $5,000.

D. C. King, improvement of business property, 911 Main St.; cost, $5,000.

Blethen & Wheeler, four-st'y business block, 25′ x 142′, cor. Sixth and Central Sts.; cost, $20,000.

Mrs. I. L. Gibbs, brick business block, 421 West Sixth St.; cost, $7,000.

Jones & Diller, brick business block, 423 West Sixth St.; cost, $7,000.

New York.

CHURCH.—The Episcopal Society of St. Edward the Martyr proposes to build on the s s of One Hundred and Ninth St., about 250′ e of Fifth Ave.

FLATS.—For Mr. John H. Gray, two flats, one 26′ x 75′, one 20′ x 53′, are to be built on the n s of Eighty-Eighth St., 64′ e of Third Ave., from plans of Mr. I. B. McIntyre.

For Mr. Chas. Tillman, a 25′ front brick and stone flat, five stories high, is to be built at 312 East Eighty-second St., from plans of Mr. Chas. Kinkel.

WAREHOUSE.—For Heywood Bros. & Co., a seven-st'y warehouse, 50′ x 120′, is to be built on Cherry St., running through to Water St., commencing 75′ e of Jefferson St. The cost of the new structure, which joins one previously built by the same company, will amount to $75,000.

BUILDING PERMITS.—*Greenwich St., No.* 404, five-st'y brick tenement, tin roof; cost, $15,000; owner, Fred. C. Bliss, 1211 Park Ave.; architect, L. H. Broome.

Suffolk St., No. 22, five-st'y brick and brown-stone dwell., tin roof; cost, $10,000; owner, Philipp Happersberger, 49 South Third St., Brooklyn; architect, W. Graul.

Suffolk St., e s, 200′ n Rivington St., 2 five-st'y Nova Scotia stone tenements, tin roofs; cost, each, $18,000; owner, George A. Blessing, 102 West Twenty-first St., and Bartholomaus Sayer, 256 Broome St.; architect, W. Graul.

Barclay St., No. 69, four-st'y brick store, tin roof; cost, $8,000; owner, estate of G. W. Welsh, 111 East Fifty-seventh St.; architect, J. E. Ware.

Beekman St., No. 128, cor. Front St., five-st'y brick and terra-cotta store and lofts, tin roofs; cost, $17,000; owner, Ellen S. Auchmuty, Lenox, Mass.; architect, G. B. Post; builders, J. B. Smith and V. J. Hedden & Sons.

Norfolk St., No. 67, five-st'y brick tenement, tin roof; cost, $18,000; owner, Mrs. Amanda F. Bunting, 31 Madison Ave.; architect, J. Downing; builder, L. H. Williams.

Water St., Nos. 418 *to* 426, three-st'y brick cooperage repair-shop, tin roof; cost, $15,000; owner, Catharine Garrick, 671 Lexington Ave.; architect, J. H. Valentine; builder, J. C. Henry.

Fourteenth St., foot of West St., one-st'y frame ferry-house, tin roof; cost, $10,000; owner, W. W. Shippen, President, Seabright, N. J.; architect, C. B. Brush; builder, P. Hermann.

Broadway, Nos. 1392, 1394, 1396, 1398 *and* 1400, n e cor. Thirty-eighth St., 5 two-st'y brick stores and lofts, tin roofs; cost, each, $15,000; owners, R. & O. Goelet, 261 Broadway; architect, J. M. Dunn; builder, M. Reid.

West Thirty-eighth St., Nos. 117–123, five-st'y brick storage, tin roof; cost, $20,000; owners, architect and builder, same as last.

West Thirty-eighth St., No. 343, five-st'y brick tenement, tin roof; cost, $13,000; owner, Augustus Eichele, 341 West Thirty-eighth St.; architect, M. L. Ungrich; builder, days' work.

Thirty-eighth St., n s, 64′ e Eighth Ave., five-st'y brick apartment-house, tin roof; cost, days' work; owner, Henry Schwarzwalder, 310 West Fifty-eighth St.; architects, Thom & Wilson; builders, J. Vix & Son.

Fiftieth St., n s, 200′ e Madison Ave., five-st'y brick and brown-stone tenement, tin roof; cost, $50,000; owner, Rosanna Spaulding, 150 East Forty-sixth St.; architects, Thom & Wilson; mason, Jas. J. Spaulding.

Fourteenth St., n s, 235′ e Third Ave., 4 five-st'y brick and brown-stone tenements, tin roofs; cost, each, $20,000; owner, P. Henry Dugro, 34 Seventh St.; architect, F. W. Klemt.

East Twenty-seventh St., No. 228, five-st'y brick tenement, tin roof; cost, $14,000; owner, James Damery, 228 East Twenty-seventh St.; architect, J. Boekell.

West Twenty-seventh St., No. 330, five-st'y brick tenement, tin roof; cost, each, $17,000; owner, Henry C. Kegeler, 328 East Twenty-seventh St.; architect, O. Wirz; builder, not selected.

Twenty-ninth St., s s, 420′ e First Ave., one-st'y brick boilers and engine, tin roof; cost, $7,900; owner, U. S. Illuminating Co., 59 Liberty St.; builders, Berston & Nickel.

Ave. A, No. 1333, cor. Seventy-first St., five-st'y brick store and tenement, tin roof; cost, $16,000; owner, Jacob Kahrs, 319 First Ave.; architect, F. Jenth.

Madison Ave., e s, 76′ 8″ s Ninety-first St., 4 three-st'y brick and brown-stone dwells., tin roofs; cost, each, $13,000; owner, Andrew J. Kerwin, No. 1 River View Terrace; architect, A. B. Ogden.

First Ave., s w cor. Eighty-ninth St., 4 five-st'y brick stores and tenements, tin roofs; cost, each, $12,000; owners, Emeline and Elizabeth Johnston; architect, A. B. Ogden, 409 East Fifty-third St.

Fifth Ave., e s, 100′ s Eighty-first St., four-st'y brick and Belleville stone dwell., mansard, slate and tin roof; cost, $50,000; owner, Louis Stern, 32 West Twenty-third St.; architect, W. Schickel; builder, T. Kiernan.

Eighty-first St., n s, 53′ e Third Ave., four-st'y brick tenement, tin roof; cost, $8,500; owner, Edward G. Tuker, 29 East Fifty-seventh St.; architects and builders, Chas. Graham & Sons.

East Eighty-first St., No. 232, five-st'y brick tenement, tin roof; cost, $18,000; owner, T. W. Gilroy, 827 East Sixtieth St.; builder, J. Brandt.

Eighty-second St., s s, 127′ w Third Ave., five-st'y brick and brown-stone tenement, tin roof; cost, $18,000; owner, Samuel W. Waldron; architect, G. A. Schellenger.

Eighty-eighth St., s s, 37′ e Lexington Ave., 2 five-st'y brown-stone tenements, tin roofs; cost, each, $20,000; owner, Eliza Beaudet, 1437 Lexington Ave.; architect, J. H. Valentine.

Eighty-eighth St., s s, 1061 6″ e First Ave., 8 five-st'y brick tenements, tin roofs; cost, each, $18,000; owners, Moore & McLaughlin, 240 East Seventy-first St.; architects, Thom & Wilson.

Eighty-ninth St., s s, 145′ w Third Ave., 2 five-st'y brick tenements, tin roofs; cost, $14,000; owner, Wm. B. Pope, 100 East Eighty-fifth St.; architect, G. C. Pope.

Ninety-first St., n s, 74′ 6″ w Lexington Ave., 6 three-st'y brick dwells., tin roofs; cost, each, $10,000; owner, John Weber, 1121 Madison Ave.; architect, same as last; builders, J. & L. Weber.

Cherry St., No. 417, five-st'y brick tenement, tin roof; cost, $15,000; Estate Bernard H. Hanigan, 196 East Seventh St.; architect, William Graul.

Ninth Ave., s e cor. Ninety-sixth St., five-st'y brick tenement, tin roof; cost, $16,000; James S. Briggs, 240′ w One Hundred and Thirty-fourth St.; architect, C. F. Ridder; builder, not selected.

Nauth Ave., e s, 21′ s Ninety-sixth St., five-st'y brick tenement, tin roof; cost, $18,000; owner, architect, etc., same as last.

Eighth Ave., s w cor. One Hundred and Thirtieth St., 4 five-st'y brick stores and tenements, tin roofs; cost, cor., $11,000; others, $13,000 each; Henry Gerkin, 1454 Third Ave.; architects, A. B. Ogden & Son.

One Hundred and Fifty-sixth St., s s, 425′ e Eleventh Ave., 3 four-st'y and three st'y and basement brick dwells.; cost, each, $4,500; Jacob and August Dux, 648 Eighth Ave., and 429 West Fiftieth St.; architect, Joseph Wolf.

One Hundred and Fifty-fifth St., s s, 180′ e Courtlandt Ave., three-st'y frame tenement, tin roof; cost, $4,000; Frederick Giese, 616′ e One Hundred and Fifty-third St.; architect and builder, E. Stichler.

Broome St., No. 12, five-st'y brick tenement, tin roof; cost, $12,000; owner and builder, David Christie, 413 West Fifty-seventh St.; architect, John F. Wilson.

ALTERATIONS. — *Fifth Ave., No.* 140, front altered, iron-work; cost, $5,000; Alfred Hearn and wife; architects, McKim, Mead & White; builder, Leonhard Hangen.

Sixth Ave., Nos. 604 *and* 606, add one st'y; also, five-st'y brick extension, tin roof; cost, $10,000; Wilhelmina Berls, on premises; architects, Thom & Wilson.

West Twenty-third St., No. 348, altered to first-class apartment-house extended, etc.; cost, $20,000; Benjamin F. Spink, 14 East One Hundred and Twenty-fifth St.; architect, C. H. P. Gilbert; builder, not selected.

West Fifty-sixth St., No. 53, two-st'y brick extension, tin roof, wooden partitions changed; cost, $6,500; Emanuel Lauer, on premises; architects, Brunner & Tryon.

Second Ave., n e cor. One Hundred and Twenty-fourth St., three-st'y and basement brick extension, tin roof, interior altered; also new store front, etc.; cost, $8,000; Fred. Sonneburg, 1043 Third Ave.; architect, J. Kastner.

Bowery, Nos. 45 *and* 47, raised 39′, altered for a theatre; cost, $30,000; Wm. A. Martin, 15 East Thirty-eighth St.; architect, L. H. Broome; builders, Robinson & Wallace and Richard Chidwick.

Philadelphia.

BUILDING PERMITS. — *Stella Ave.*, cor. Emerald St., two-st'y dwell., 16′ x 35′; C. Harris, contractor.

Hope St., No. 1731, three-st'y dwell., 18′ x 30′; Jas. Quigley, contractor.

Franklin St., s of Lehigh Ave., 9 two-st'y dwells., 15′ x 42′; Jno. Loughran, owner.

Thirteenth St., n e cor. Locust St., addition to college-building, 55′ x 105′; R. Q. Gibbon, contractor.

Atlantic St., n of Dauphin St., 5 two-st'y dwells., 13′ x 28′; O. A. Scarlet, owner.

Seventh St., above Moore St., 5 two-st'y dwells., 16′ x 44′; T. C. Nesbitt, contractor.

Frankford Road, No. 2418, three-st'y dwell., 18′ x 85′; Geo. Kessler, contractor.

Coral St., cor. Columbia St., three-st'y dwell., 18′ x 40′; contractor, same as last.

Jefferson St., w of Division St., 2 three-st'y dwells., 18′ x 40′; P. Farley, contractor.

Preston St., s e cor. Westminster Ave., three-st'y dwell., 20′ x 75′; H. Grau, contractor.

Clearfield St., w of Broad St., 2 two-st'y dwells., 15′ x 40′; H. Miller, owner.

Twentieth St., s of Dickinson St., two-st'y dwell., 16′ x 43′; G. Lafferly, owner.

Twentieth St., above Tasker St., 2 two-st'y dwells., 16′ x 46′; Wm. Marshall, owner.

Porcelain St., w of Twentieth St., 3 three-st'y dwells., 17′ x 28′; Jno. Eisenman, contractor.

Deal St., cor. Adams St., 4 two-st'y dwells., 14′ x 42′; J. P. Gerkes, contractor.

Page St., e of Twenty-third St., 22 two-st'y dwells., 16′ x 48′; E. H. Flood, contractor.

Fontaine St., e of Twenty-third St., 11 two-st'y dwells., 16′ x 48′; contractor, same as last.

Columbia Ave., w of Broad St., three-st'y dwell., 18′ x 63′; H. H. Martin, contractor.

Emerald St., cor. Clemantine St., 3 two-st'y buildings, 14′ x 40′; J. G. Baldt & Son, contractors.

Locust Ave., cor. Chew St., 6 three-st'y dwells., 17′ x 43′; Jas. Kinear Sons, contractors.

Fourth St., w s, s of Columbia Ave., factory, 52′ x 79′; J. B. Stetson, owner.

Kiehl St., below Amber St., 6 two-st'y dwells., 16′ x 26′; Geo. Miller, contractor.

Howard St., cor. Cumberland St., three-st'y dwell., 20′ x 58′; Daniel Neveling, contractor.

Garfield St., e of Wakefield St., two-st'y dwell., 16′ x 43′; G. W. Baxter, contractor.

Tacony St., near Tucker St., two-st'y dwell., 20′ x 46′; J. G. Taylor & Son, contractors.

Buckins St., near Locust Ave., 2 two-st'y dwells., 16′ x 29′; J. Tolson, contractor.

West College Ave., e of Twenty-fifth St., 40 two-st'y dwells., 14′ x 35′; C. W. Henry, owner.

Blockley Almshouse, dead-house, 35′ x 40′; G. Emory, contractor.

Fiftieth St., cor. Lancaster Ave., school-house, 64′ x 102′; M. J. McCloskey, contractor.

Venango St., w of Seventh St., 11 two-st'y dwells., 16′ x 50′; M. McIlvaine, owner.

Lombard St., w of Sixth St., two-st'y shop, 18′ x 40′; Ed. Ward, owner.

Lancaster Ave., w of Forty-sixth St., 2 two-st'y dwells., 18′ x 30′; B. Hoover, contractor.

Front St., below Arch St., five-st'y store, 28′ x 41′; Wendell & Smith, contractors.

Paul St., e of Frankford Road, 24 two-st'y dwells., 17′ x 42′; contractor, same as last.

Franklin St., s of Norris St., 14 three-st'y dwells., 15′ x 56′; W. H. Bilyue, owner.

Ginodo St., w of Eighteenth St., 11 three-st'y dwells., 14′ 6″ x 45′; B. Ketcham & Son, contractors.

Cedar St., cor. Terrace St., two-st'y dwell., 18′ x 42′; Thos. Haggerty, owner.

Twenty-second St., between Manton and Oakford Sts., 8 two-st'y dwells., 15′ x 42′; H. R. Coulombs, owner.

Twenty-eighth St., above Oxford St., 7 two-st'y dwells., 15′ x 40′; W. H. Lower, owner.

Penn St., cor. Allen St., dwell., 20′ x 35′; W. Milnor, contractor.

Wenton St., w of Eighth St., 19 two-st'y dwells., 13′ x 35′; H. McNeill, owner.

Lawrence St., n of Clearfield St., 16 two-st'y dwells., 15′ x 34′; P. McTague, contractor.

Orkney St., n of Clearfield St., 7 two-st'y dwells., 13′ x 34′; contractor, same as last.

Indiana Ave., w of Lawrence St., 6 two-st'y dwells., 15′ x 44′; contractor, same as last.

Queen St., near Thirty-fifth St., 8 two-st'y dwells., 15′ x 30′; H. J. Becker, owner.

Seventeenth St., s of Race St., two-st'y church, 45′ x 91′; F. Tweed, contractor.

Ridge Ave., cor. Parkers Ave., one-st'y wagon-house, 30′ x 35′; R. C. Pestor, contractor.

Franklin St., n of Huntingdon St., 7 two-st'y dwells., 12′ x 28′; Jacob Rightly, owner.

Thirtieth St., cor. Hartwell Ave., three-st'y dwell., 38′ x 58′; W. C. Mackey, contractor.

Highland Ave., near Germantown Ave., 2 three-st'y dwells., 17′ x 46′; contractor, same as last.

Hope St., cor. Huntingdon St., one-st'y building, 20′ x 30′; Geuttner, contractor.

Belgrade St., cor. Lehigh Ave., two-st'y brick building, 38′ x 63′; Moore & Sons, contractors.

Germantown Ave., above Bremer St., two-st'y store, 28′ x 50′; J. B. Minnich, contractor.

Sixteenth St., s of Berks St., 11 three-st'y dwells., 16′ x 56′; J. S. Serrill, owner.

Broad St., n of Butler St., three-st'y dwell., 39′ x 67′; W. McLaughlin, contractor.

Elizabeth St., n of Unity St., 2 two-st'y dwells., 13′ x 44′; A. T. Richards, contractor.

Fisher St., s of Lehigh Ave., two-st'y warehouse, 44′ x 130′; contractor, same as last.

Penn St., n w cor. Preston St., 7 three-st'y dwells., 17′ x 55′; E. L. Michaelson, contractor.

Sergeant St., w of Trenton Ave., 3 three-st'y dwells., 16′ x 32′; Jas. McNutt, contractor.

Maud St., e of Twenty-eighth St., 10 two-st'y dwells., 15′ x 39′; J. E. Ridgway, owner.

Tioga St., w of Nineteenth St., three-st'y dwell., 18′ x 57′; B. Walker, contractor.

Franklin St., n of Girard Ave., three-st'y dwell., 18′ x 57′; contractor, same as last.

Ogden St., between Liberty and Union Sts., 3 two-st'y dwells., 15′ x 44′; C. F. Hall, owner.

Union St., s of Ogden St., 5 two-st'y dwells., 16′ x 44′; contractor, same as last.

Oakford St., w of Twenty-second St., 4 two-st'y dwells., 16′ x 37′; Robt. Paul, contractor.

Broad St., s of Ellsworth St., three-st'y dwell., 20′ x 86′; Thos. Little & Son, contractors.

North Nineteenth St., Nos. 1730 *and* 1732, 2 three-st'y dwells., 17′ x 60′; Geo. Gillmora, contractor.

St. Louis.

BUILDING PERMITS.—One hundred and eight permits have been issued since our last report, nine of which are for unimportant frame houses. Of the rest those worth $2,500 and over are as follows:—

R. Albin, 4 adjacent two-st'y brick tenements; cost, $5,000.

Mrs. Kennedy, two-st'y double brick dwell.; cost, $3,500.